Cedar 8880AG
Enterprise Dual-Radio
Access Point/Bridge
User Guide

Release 2.0
March 2008

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United States 802.11a 5250 Mhz ~ 5350 MHz Usage Note:

Due to US DFS requirement, the 802.11a radio frequency usage from 5250 Mhz to 5350 MHz is temporarily disabled for US model. This band will be enabled in the future through firmware upgrade after the product has finished and passed DFS test.

FCC Compliance

This equipment has been tested and found to be in compliance with the limits for FCC Part 15, Class B digital device. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with instruction manual, may cause harmful interference with radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The users are prohibited from making any change or modification to this product, any modification to this product shall void the user's authority to operate under FCC Part 15 Subpart A Section 15.21 regulations.

"This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and, (2) this device must accept any interference received, including interference that may cause undesired operation.

Caution

Reader should be positioned so that personnel in the area for prolonged periods may safely remain at least 20 cm in an uncontrolled environment from the reader's surface. Observe FCC OET Bulletin 56 "Hazards of radio frequency and electromagnetic fields" and Bulletin 65 "Human exposure to radio frequency electromagnetic fields."

Frequency Stability Statement

A carefully chosen AT-cut crystal resonator that offers tight frequency tolerance and stability over operating temperature is used in this device so that frequency stability of this device is ensured to be within +/- 15 ppm that an emission is maintained within the

band of operation under all conditions of normal operation as specified in this users guide.

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Introduction

This manual contains information on configuring and managing the Intelicis Enterprise Dual-Radio Access Point – Cedar880 product family. It is organized into the following chapters:

- **Introduction**: Overview of the wireless network and access point deployment
- **Installation**: Description of the Cedar880 hardware
- **Initial Configuration**: Description of Cedar880 initial configuration and the management interfaces
- **System**: Instructions for changing system parameters
- **Network:** Instructions for changing network parameters
- **Security:** Instructions for configuring RADIUS and authentication profiles
- **Wireless Network:** Instructions for configuring and monitoring wireless network
- **Management:** Instructions for changing management interface settings
- **Log:** Description of the log file
- **Monitor:** Description of how to monitor the system
- **Command Line Interface:** Description of Command Line Interface (CLI) syntax

1.1 Wireless Network

A wireless network is a flexible data communications system that extends the capability of the existing wired network to provide connectivity for wireless devices. Unlike the traditional wired network which relies on physical cables and wires to transmit and receive data, a wireless network relies on radio frequency (RF) technology to transmit and receive data.

A Wireless Access Point (AP) is a device that connects wireless communication devices. It is usually connected to a wired network on one end, and relays data to the wireless network on the other end.

The advent of the wireless network opens up the possibility of what a network infrastructure can be. Without the restriction of wires, the network can move with users and change as fast as the organization does. Figure 1.1 illustrates a sample wireless network.

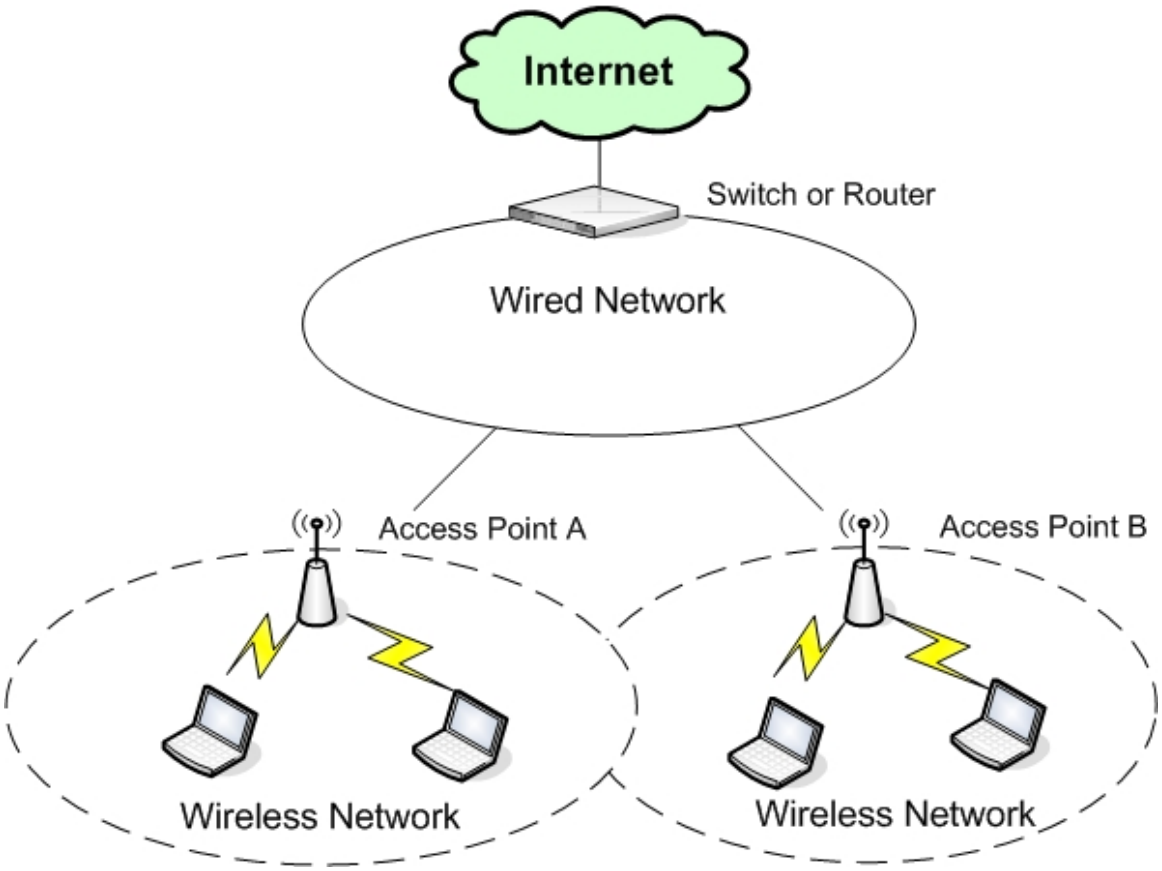


Figure 1.1 Wireless Networks

1.2 Wireless LAN Bridge

Cedar Wireless Access Point provides the capability of being configured as a regular Access Point, a Wireless LAN Bridge or both. A Wireless LAN Bridge wirelessly connects two ore more Ethernet LANs together. It is a very practical, easy and in most cases inexpensive way to connect Ethernet LANs or extend the range of existing WLANs. As illustrated in Figure 1.2 and 1.3, the access point can operate in point-to-point or point-to-multipoint bridge topology.

Point-to-point

Point-to-point link allows you to use two access points to bridge two Local Area Networks from different locations. Access point A serves as a base bridge while Access point B serves as a non-base bridge. Both access points relay data between the two

networks. This is an ideal topology for connecting main office with warehouse, or between office buildings.

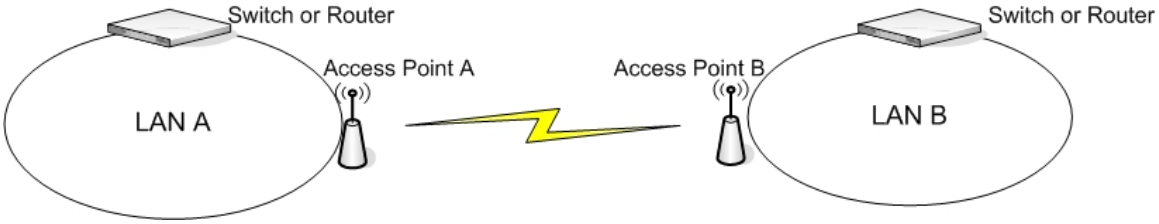


Figure 1.2 Point-to-Point Bridge

Point-to-Multipoint

Point-to-Multipoint Bridge allows you to use multiple access points to bridge Local Area Networks from different locations. Access point A serves as a base bridge while Access point B and C serve as non-base bridges. This is an ideal topology for central office to collect data from remote offices.

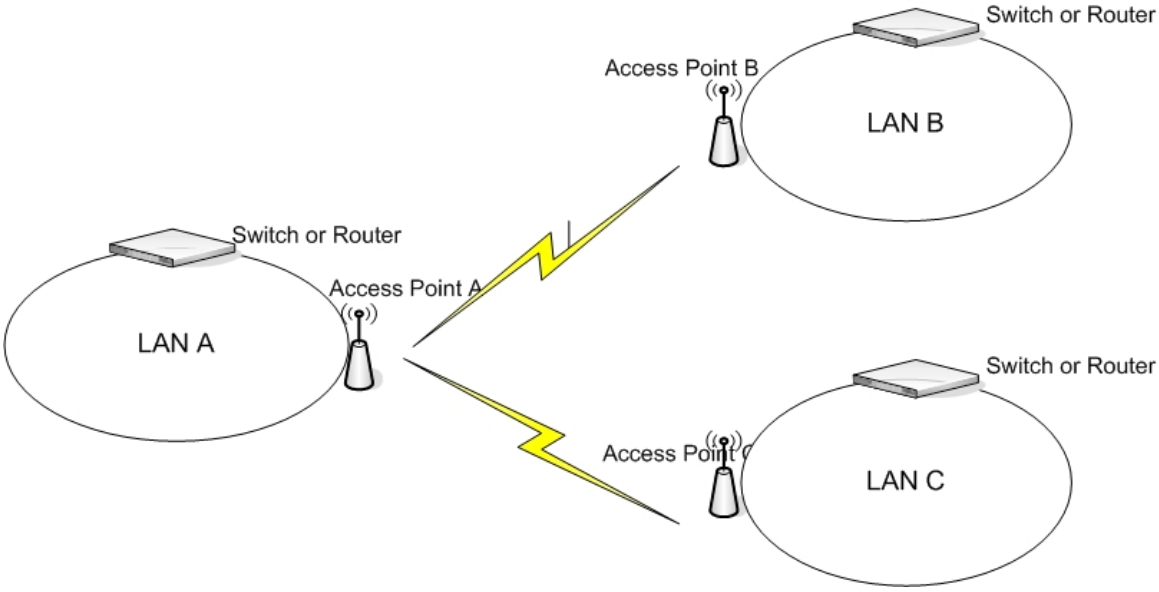


Figure 1.3 Point-to-Multipoint Bridge Mode

1.3 Wireless Mesh Network

A wireless mesh network is a communications network made up of radio nodes in which there are at least two pathways of communication to each node. A mesh network requires little configuration and offers reliability and redundancy. When one node can no longer

operate, the rest of the network can still communicate. It allows for continuous connections and reconfiguration around broken or blocked paths.

Mesh networks are self-configuring. When the mesh nodes power up, the nodes hear each other's broadcast and a network is automatically forms. Mesh networks are also self-healing. When a node breaks downs or a connections goes bad, the nodes re-discover an alternative routing path. Network connectivity is thus preserved automatically. Figure 1.4 illustrates a Wireless Mesh Network.

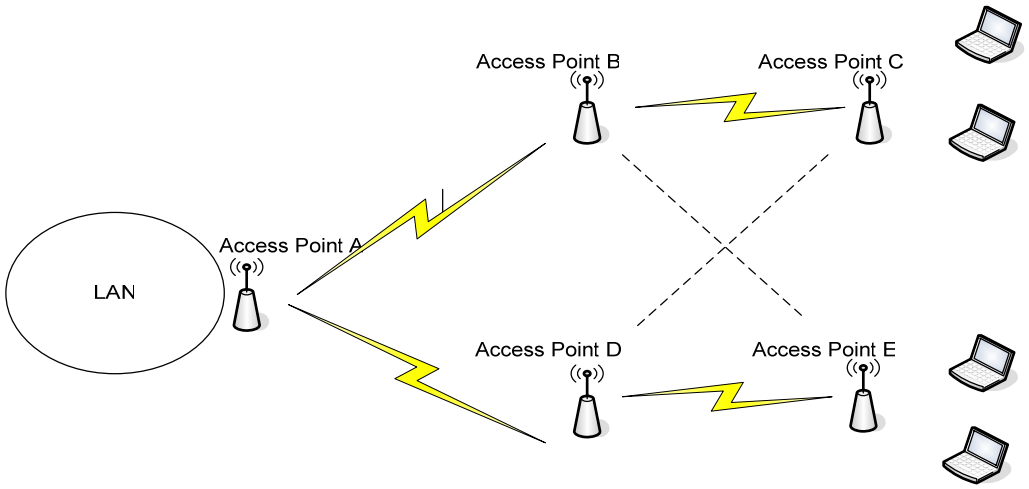


Figure 1.4 Wireless Mesh Network

Cedar 880 dual-radio design allows one radio focus on Wi-Fi access and the other radio to perform mesh related tasks; thus significantly improves mesh network system performance.

1.4 Access Point Deployment

The deployment of access point depends greatly on the building structure, the existing wiring and the type of service to be deployed. For example, RF signals transmit much easier through a wood-frame building than through a concrete one. For newly constructed buildings where Ethernet cable CAT 5 is pre-installed, wiring is not a concern. For older construction, where re-cabling is cost prohibitive, a solution which is less dependent on wiring such as LAN Bridge may be more viable.

The access point coverage areas should overlap to ensure there are no gaps and roaming clients always have a connection available. In addition, the number of active wireless users and the type of service they are using (e.g. VoIP) are important factors to consider.

1.5 Application Deployment

Applications can be deployed easily after a network infrastructure is in place. Figure 1.5 illustrates a possible scenario:

- High Speed Internet Access is available for all wireless clients.
- Voice over IP applications can be used for calling over the Internet.
- Streaming media data can be offered over the IP network.
- Handheld devices for mobile staff can easily communicate with each other.
- All voice, video and data are transmitted seamlessly using QoS technology.

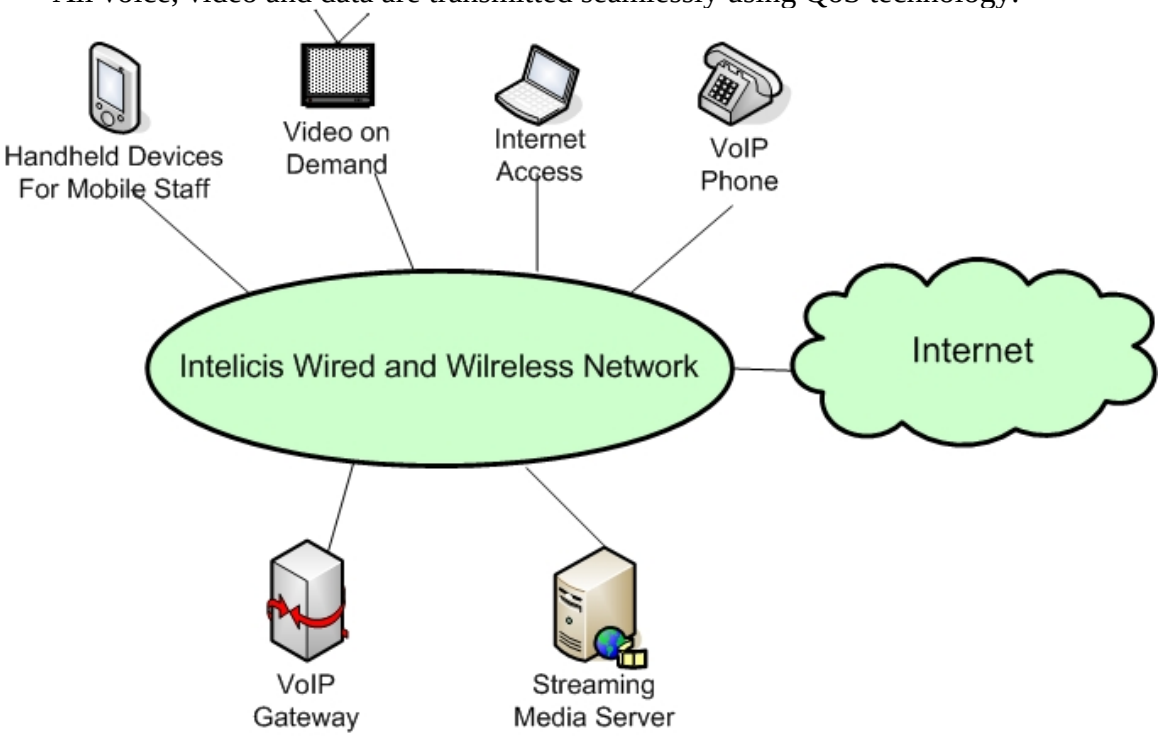


Figure 1.5 Application Deployments

2 Installation

This chapter provides instructions on how to install Cedar 880AG.

2.1 Package Contents

Before installation, please inspect the package contents first and report any missing or damaged items to your sales representative. This package should contain the following:

Cedar 880AG Indoor AP

- Cedar 880AG Dual-Radio Access Point
- Antenna (2)
- Wall Mount Bracket with Mounting Accessories
- Mounting rubber foot (for desktop installation) (4)
- Power Adaptor
- CAT5 Ethernet Cable (RJ45 to RJ45)
- Cedar 880AG Product Resource CD

Cedar 880AG Industrial Edition

- Cedar 880AG Dual-Radio Access Point
- Antenna (2)
- Mounting Bracket with Mounting Accessories
- CAT5 Ethernet Cable (RJ45 to RJ45)
- Waterproof Ethernet Connector
- Waterproof Antenna Connector cap
- Cedar 880AG Product Resource CD

2.2 Physical Description

2.2.1 Top Panel

Figure 2.1 Cedar 880AG Top Panel

- **Power LED**
  This Power LED is constantly ON when power is applied.

- **Ethernet Link/Activity LED**
  This LED is ON when Ethernet establishes link; flashing when there is Ethernet activity.

- **802.11a Wireless LED**
  This LED is slow flashing when 802.11a wireless is ready for client to associate; fast flashing when there is traffic on 802.11a wireless.

- **802.11g Wireless LED**
  This LED is slow flashing when 802.11g wireless is ready for client to associate; fast flashing when there is traffic on 802.11g wireless.

2.2.2 Rear Panel

- **DC Power Jack (Indoor AP only)**
  The DC power jack provides the connection to the external 5V DC 2A power supply.

- **Reset Button (Indoor AP only)**
  The Cedar 880AG rear panel contains one reset button which will reset the unit to the manufacturer's default configuration. Press and hold the button down for at least 5 seconds and the unit will automatically reboot and reset to the manufacturer's default configuration.

- **RJ45 Connector**
  The RJ45 connector provides the connection switch or gateway through a CAT 5 cable. This connector also provides the connection to PoE power source.

- **DB9 Connector (Indoor AP only)**
  This DB9 connector provides the connection to the PC serial port for local management. A straight RS232 cable is needed (not included in the package).

- **Antenna Connectors**
  Two reverse polarity TNC jack connectors are provided for connecting to antennas. The antennas must have a reverse polarity TNC plug connector to be used with Cedar 880AG.

2.2.3 LED Description

LED	Color	Indication
	Green, solid	The unit power is on.
	Off	The unit power is off.
	Blue, solid	The Ethernet port has successful link.
	Flashing	The Ethernet port is linked and has activity
	Orange, slow flashing	The 802.11a wireless is ready for client to associate.
	Fast flashing	There is activity on 802.11a wireless
	Off	The 802.11a wireless is not ready.
	Orange, slow flashing	The 802.11g wireless is ready for client to associate.
	Fast flashing	There is activity on 802.11g wireless
	Off	The 802.11g wireless is not ready.

2.3 Install the Unit

2.3.1 Indoor AP Mounting Options

- The Cedar 880AG is designed with two installation options:On desktop or shelf
- Wall mount

Mounting Cedar 880AG on desktop or shelf:

- Adhere the 4 mounting rubber feet to the bottom of the unit.
- Place the unit on a secure, flat surface.

Mounting Cedar 880AG on wall:

- At desired wall location, position nails to match the wall mount holes on the bottom of the unit.
- Secure unit firmly on the nails.

2.3.2 Industrial Edition AP Mounting Options

The Cedar 880AG Industrial Edition is designed with two installation options:

- Wall mount
- Pole mount

Mounting Cedar 880AG Industrial Edition on wall:

- At desired wall location, secure mounting bracket firmly on the wall with nails.
- Match the unit's 4 copper posts with the bracket holes
- Slide the unit down to secure it onto the bracket

Mounting Cedar 880AG on pole:

- Attach the mounting bracket to the pole with a flexible band (not included)
- Secure the unit firmly to the mounting bracket

2.3.3 Supplying Power to the Unit

The Indoor Cedar 880AG is equipped with a universal 100-240 VAC, 50/60 Hz power supply. To power the unit, connect the included power adaptor to the wall outlet and plug the DC output connector into the power jack on the rear panel of Cedar 880AG.

Cedar 880AG also supports the 802.3af PoE standard. If your switch or gateway has the capability to supply PoE to remote devices, simply connect the Ethernet cable from your switch or gateway to the RJ45 connector on the rear panel of Cedar 880AG. This will automatically supply power to the unit.

2.4 Connecting Cedar 880AG (Indoor AP only)

To establish a connection to Cedar's console interface, you will need to:

- Connect a regular straight serial cable to the console port located on the rear panel of the unit.
- Connect the other end of the serial cable to a terminal or PC.

After the unit is turned on, the LEDs on the top panel will follow the pattern described below:

- The Power LED goes on.
- The Ethernet LED will be ON if the Ethernet port is connected to a switch or gateway and a valid link is established.
- After 30 seconds, the 802.11a and 802.11g LEDs will be flashing.

3 Initial Configuration

This chapter contains the following information:

- Discover AP's IP address using Scan Tool
- Cedar's default settings
- Web Management Interface
- Command Line Interface

3.1 Scan Tool

Cedar 880AG by default acquires its IP address and subnet mask from the DHCP server. The administrator can use the Scan Tool to find out the AP's IP address.

Scan Tool is a utility that is included in the AP CD-ROM. It scans the network and displays all the available Cedar Access Points. Scan Tool provides the following functions:

- Discover Cedar AP's IP address, MAC address and firmware version.
- Change AP's IP address.
- Upgrade AP's firmware
- Switch on/off AP's telnet, SNMP and web interface.

Please follow the steps described below to use the Scan Tool:

1. Insert the installation CD into your CD-ROM drive to install the Scan Tool software. Follow the on-screen instructions to install Scan Tool on your computer.

2. Scan Tool requires Java 1.4 or newer version installed on your computer. You can choose to install Scan Tool along or with the Java software.

3. Double click the Scan Tool icon on the desktop to launch the Scan Tool software. Scan Tool scans the local area network and displays all the Cedar Access Points that it discovers (Figure 3.1).

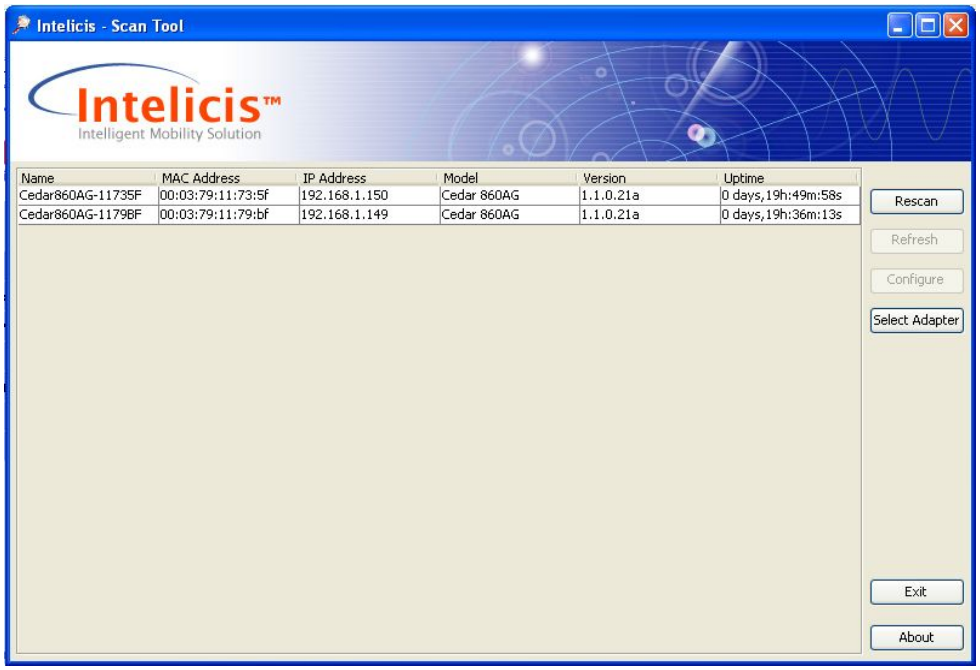


Figure 3.1 Scan Tool Main Screen

4. Locate the AP you want to manage by using the MAC address (AP's MAC address can be found at its back panel). If the AP has acquired an IP address from the DHCP server, use it to log in to AP's web interface (section 3.3).

5. If DHCP server is not available in the system, AP's IP address is displayed as 0.0.0.0. Click the AP entry and then the ***Configure*** button to enter the configure IP screen (Figure 3.2).

Figure 3.2 Scan Tool Configure IP Screen

6. The administrator can assign a static IP address to the AP by :
   a) Change IP address mode to static
   b) Enter IP address, subnet mask and gateway IP address.
   c) Provide the SNMP read/write community name in order to make any configuration change. The Cedar initial SNMP read/write community name is ***private***.

7. You can also use Scan Tool to upgrade the AP firmware by clicking the ***Upgrade*** tab:

   a) Select either FTP or TFTP protocol.
   b) Enter server IP address, firmware name and optional FTP login name and password.
   c) Provide the SNMP read/write community name. The Cedar initial SNMP read/write community name is ***private***.

8. In case SNMP, telnet or web interface are accidentally turned off, Scan Tool can be used to turn them back on again by clicking the ***Advanced*** tab.

☞ Intelicis Scan Tool scans Intelicis access points only. It does not scan access points from other manufactures.

☞ Please run one instance of Scan Tool on a network. Running multiple instances may receive incorrect scan result.

3.2 Default Setting

Table 3.1 lists Cedar's manufacturer default settings:

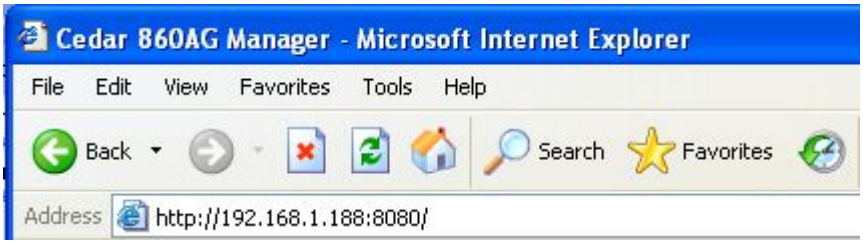
Default login name	admin
Default login password	changeitnow
Default enable password	changeitnow
Default IP address	Acquired from the DHCP server.
Default subnet mask	Acquired from the DHCP server.
Default gateway	Acquired from the DHCP server.
Default DNS IP address	Acquired from the DHCP server
Default management VLAN ID	Untagged
Default SSID for Radio 1	Intelicis-a

Default SSID for Radio 2	Intelicis-g

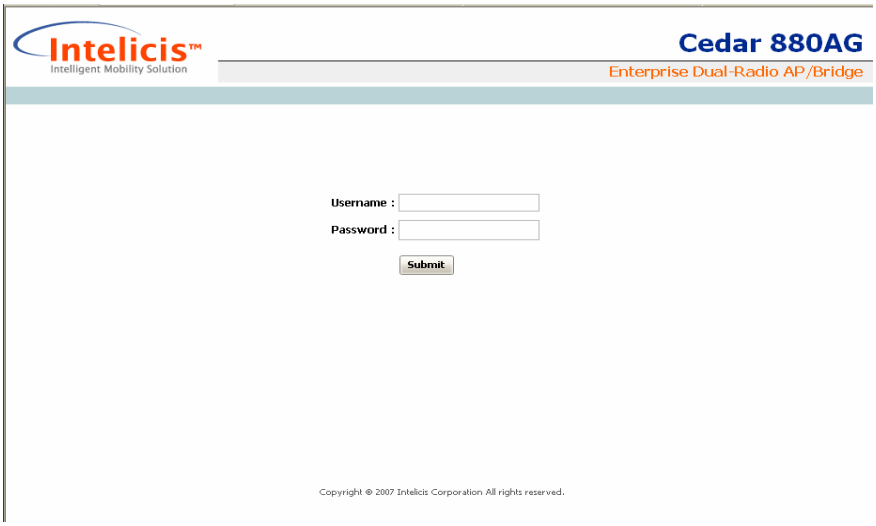
Table 3.1 Cedar Manufacturer Default Setting

3.3 Web Management Interface

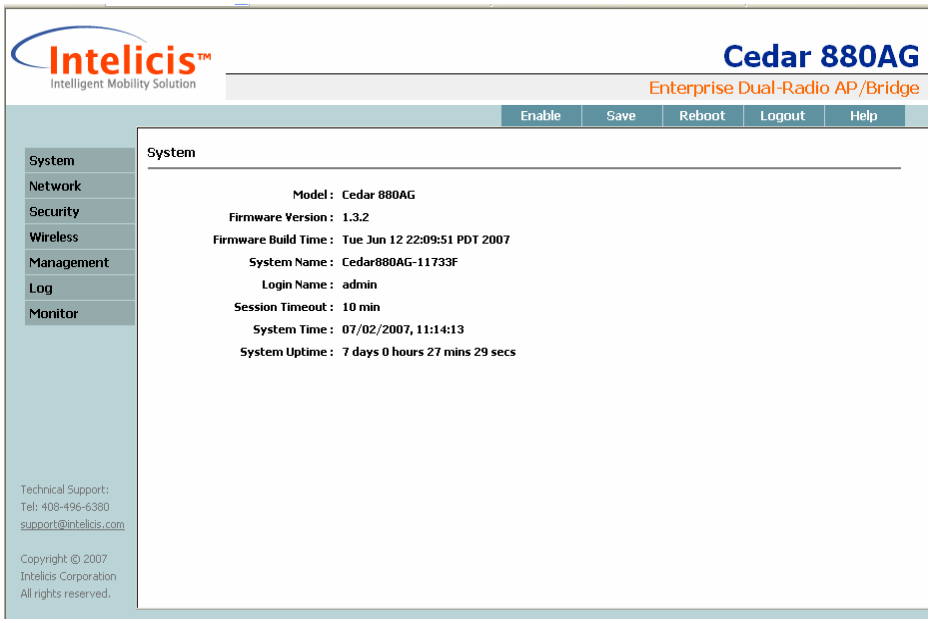
The Cedar Web Management Interface is accessible from any web browser on the network. Enter the Cedar IP address and port 8080 in the browser address line to activate the Cedar Web Interface.



You will be prompted for username and password. Enter the default username “admin” and password “changeitnow”.



After the initial login, the home page is displayed. The administrator now has easy access to configuring system parameters as well as managing any AP activities.



3.3.1 Menu

The menu displayed on the left side of the screen allows the administrator to perform the following configurations:

- **System**: Configure system parameters such as system name, password and upgrade
- **Network**: Configure network parameters such as IP address, default route and VLAN
- **Security**: Configure security parameters such as RADIUS and authentication profiles
- **Wireless**: Configure wireless parameters such as SSID, radios
- **Management**: Configure Telnet, SSH and SNMP parameters
- **Log**: Display system log file
- **Monitor**: Display statistics and usage of the system

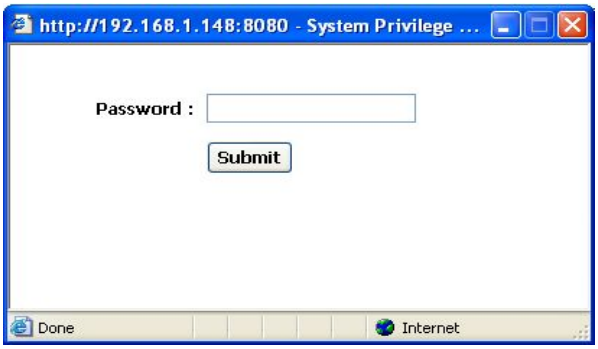
3.3.2 Tool Bar

The tool bar located in the upper right-hand corner provides a shortcut to frequently used operations. Here is a summary of each of their functions.

Enable

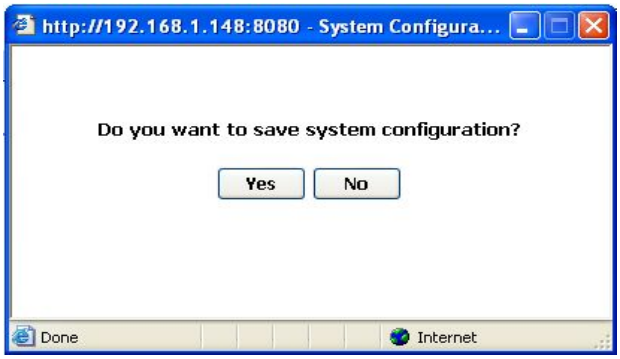
Cedar 880 has two operating modes: normal and privilege. The normal mode allows the administrator to view most, but not all of the system parameters. The privilege mode allows the administrator to view all of the system parameters as well as modify them.

In order to perform any configuration changes, you need to be in the privilege mode. To enter the privilege mode, click ***Enable***, and enter your privilege password.



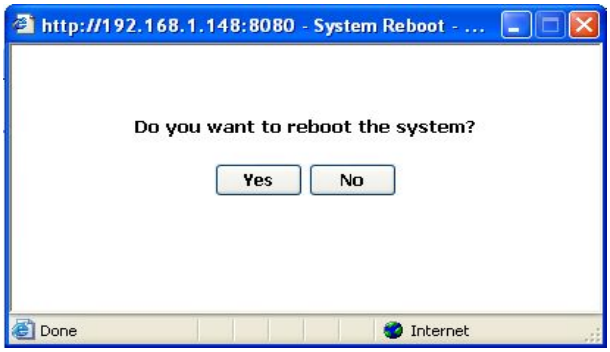
Save

All configuration changes must to be saved into the system. One efficient way of doing this is by clicking ***Save***. The save operation is required; otherwise changes will be lost after reboot.



Reboot

Sometimes, you may need to reboot the system in order for any new changes to take effect. Click ***Reboot*** to reboot the system.



Logout

Click ***Logout*** to log out of the system.

Help

Click ***Help*** to receive on-line help information.

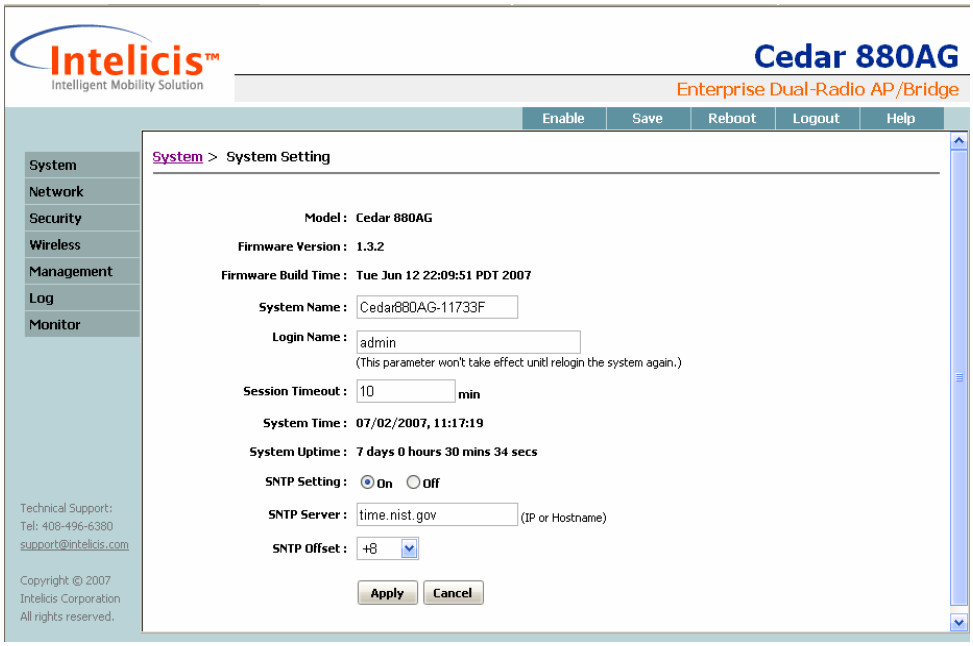
4 System

This chapter contains information on the following topics:

- Change system setting
- Change password and privilege password
- Upgrade
- Execute CLI command file
- Import/Export configuration file

4.1 System Setting

Select ***System*** **>*Setting*** to change system parameters.



System Name

The **System Name** is a descriptive string (maximum length of 20) that describes the system. The default value is <none>.

Login Name

The administrator uses the combination of **Login Name** and **Login Password** to log in to Cedar. After log in, the administrator can view most of the system parameters. In order to view all of the system parameters and perform any changes, the administrator needs to enter the privilege mode.

The **Login Name** may have a maximum length of 31. The default value is “admin”.

Session Timeout

The Cedar Command Line Interface times out after the session is inactive for a period of time. This parameter specifies the time out period in minutes. The default is 10 minutes.

SNTP Setting

This Simple Network Time Protocol (SNTP) setting is used to synchronize computer clocks on the Internet. If the setting is on (default), Cedar automatically synchronizes its clock with the reference SNTP Server.

SNTP Server

Specify the IP address or the host name of the reference SNTP Server. The default value is "time.nist.gov".

SNTP Offset

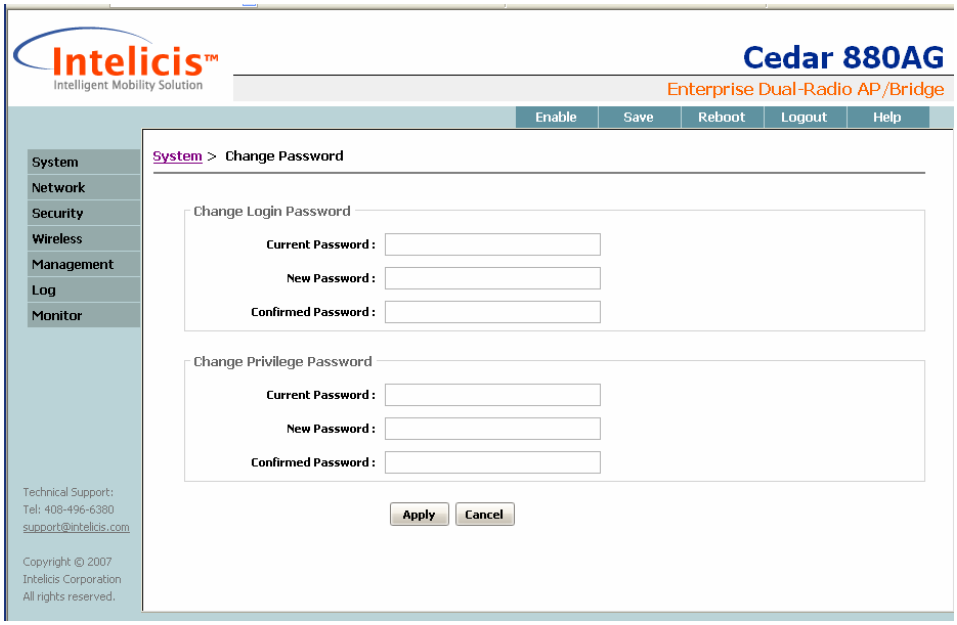
The SNTP Server uses the UTC (Universal Time, Coordinated) as the reference for the current time. The SNTP offset specifies the number of hours to be added to or subtracted from the UTC time for conversion to local time. Here are some examples:

- San Francisco, California, USA: UTC - 8
- Toronto, Ontario, Canada: UTC - 5
- Stockholm, Sweden: UTC + 1
- Beijing, China: UTC + 8
- Tokyo, Japan: UTC + 9

☞ Changes to **System Name** and/or **Login Name** are saved automatically. You do not need to save the changes by clicking ***Save*** in the tool bar.

4.2 Change Password

Select ***System*** **>** ***Change Password*** to change the login password and/or privilege password. It is highly recommended that the administrator change the default values after initial installation.



Login Password

The administrator uses the combination of **Login Name** and **Login Password** to log in to Cedar. After log in, the administrator can view most of the system parameters. In order to view all of the system parameters and perform any changes, the administrator needs to enter the privilege mode.

The manufacture default value for **Login Password** is "changeitnow".

Privilege Password

The **Privilege Password** is used by the administrator to enter the privilege mode. The manufacture default value is "changeitnow".

☞ Changes to **Login Password** and/or **Privilege Password** are saved automatically. You do not need to save the changes by clicking ***Save*** in the tool bar.

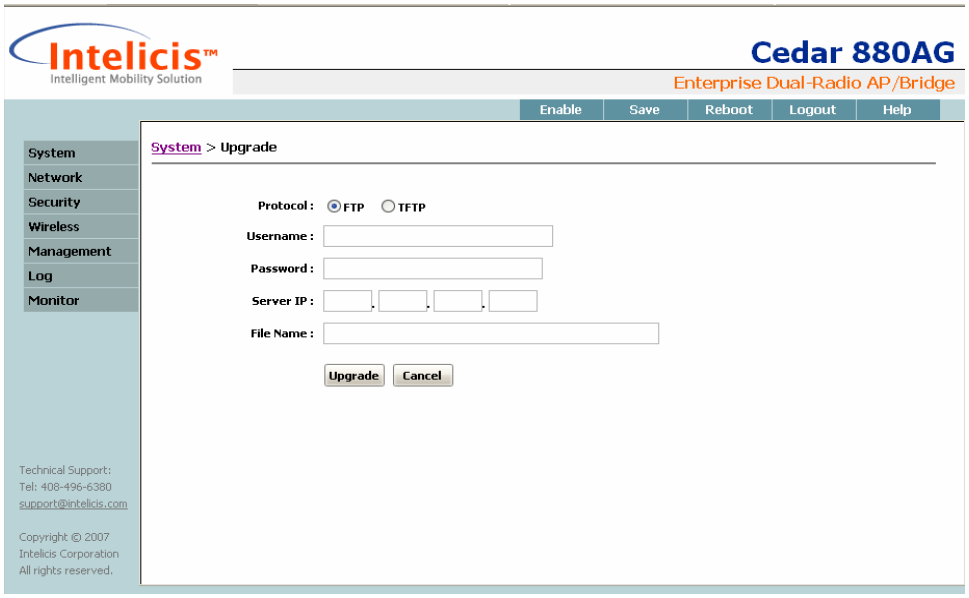
4.3 Upgrade

Intelicis offers free firmware upgrades for bug fixes and patches. Please visit the Intelicis web site at www.intelicis.com for the latest upgrade. Choose one of the following methods to download the upgrades.

- Copy the new firmware to a local FTP server root directory. Make sure the file can be retrieved via "anonymous" login with no password.

- Copy the new firmware to a user's FTP home directory. Make sure the file can be retrieved by logging in with the user's username/password.

Select ***System*** > ***Upgrade*** to upgrade the firmware.



Protocol

Choose either FTP (File Transfer Protocol) or TFTP (Trivial File Transfer Protocol).

Username/Password

Enter the username and password Cedar uses to log into the FTP server. If the username and password are not specified, Cedar logs in to the FTP server as "anonymous" with no password.

Server IP

The **Server IP** is the IP address of the local FTP or TFTP server where Cedar can retrieve the firmware. An example of the **Server IP** is 192.168.15.184.

File Name

Enter the Cedar 880AG firmware name. The firmware name is composed of three parts: model name-date-version number. For example, cedar880ag-09302005-1.1.0.88a.bin refers to Cedar model 880 version 1.1.0.88 created on 09/30/2005.

4.4 System Configuration

Select ***System*** > ***Configuration>CLI Script*** to execute CLI command batch files.

Execute CLI Command File

The administrator can put all the CLI commands in a batch file and execute them together. Command batch files are especially useful when the administrator needs to make sizeable configuration changes. One of the following methods can be chosen:

- Copy the command file to a local FTP server root directory. Make sure the file can be retrieved via "anonymous" login with no password.

- Copy the command file to a user's FTP home directory. Make sure the file can be retrieved by logging in with the user's username/password.

Enter the FTP Server IP address and the username and password Cedar uses to log in to the FTP Server. If the username and password are not specified, Cedar logs into the FTP server as "anonymous" with no password. Cedar retrieves the specified CLI command file and executes it immediately.

Select ***System*** **>** ***Configuration*** **>** ***Configuration*** File to import/export configuration files.

Startup Configuration File

The administrator can choose a startup configuration file for the AP to startup the system.

Save Current Configuration

The existing configuration can be saved to a file in binary format for archiving purpose. If for any reasons, a recovery is required. The configuration file contains useful information.

Export/Import

After a configuration file is saved, it can then be exported to local disk or external FTP server. Configuration file is designed to be shared among APs with the same model. For example, the administration can create a master file with the desired configuration. The file can then be imported to multiple APs for easy administration.

5 Network

This chapter contains information on the following topics:

- Change network settings
- Configure VLAN
- Configure DHCP Server

5.1 Overview

5.1.1 VLAN

Virtual LAN (VLAN) logically groups users by their functionality instead of physical location. VLAN uses software to configure logical topologies on top of the physical network infrastructure. Users grouped into one VLAN may be located on different floors or in different buildings. However, all users on one VLAN can communicate with each other as if they were all on the same physical LAN.

The same concept extends to a wireless network. Wireless clients can be grouped into wireless sub-networks. A client can access the network by connecting to an AP which supports its assigned VLAN (see Figure 5.1).

VLANs provide many benefits:

- VLANs increase performance by limiting broadcast traffic for both wired and wireless networks.

- VLANs improve manageability by providing an easy, flexible way to modify logical groups in changing environments. When a computer is physically moved to another location, it can stay on the same VLAN without any hardware reconfiguration.

- VLANs increase security options. Broadcast traffic is only broadcast within the VLAN. This allows the network administrator to segment users requiring access to sensitive information into VLANs separate from the rest of the community.

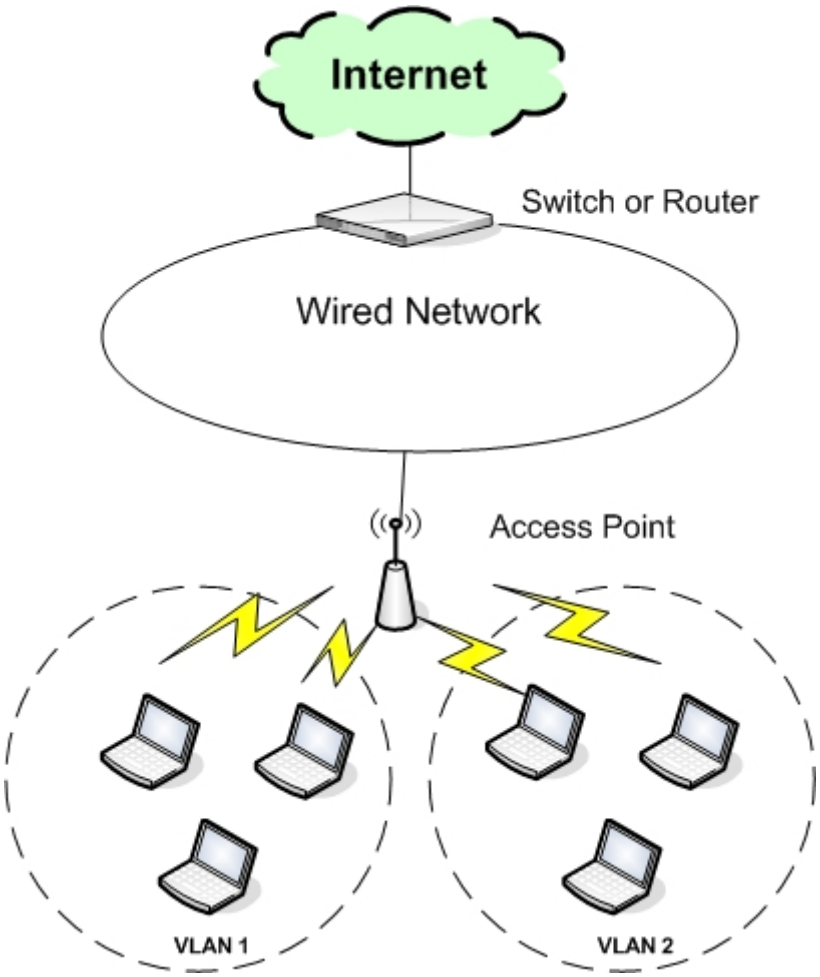


Figure 5.1 VLANs

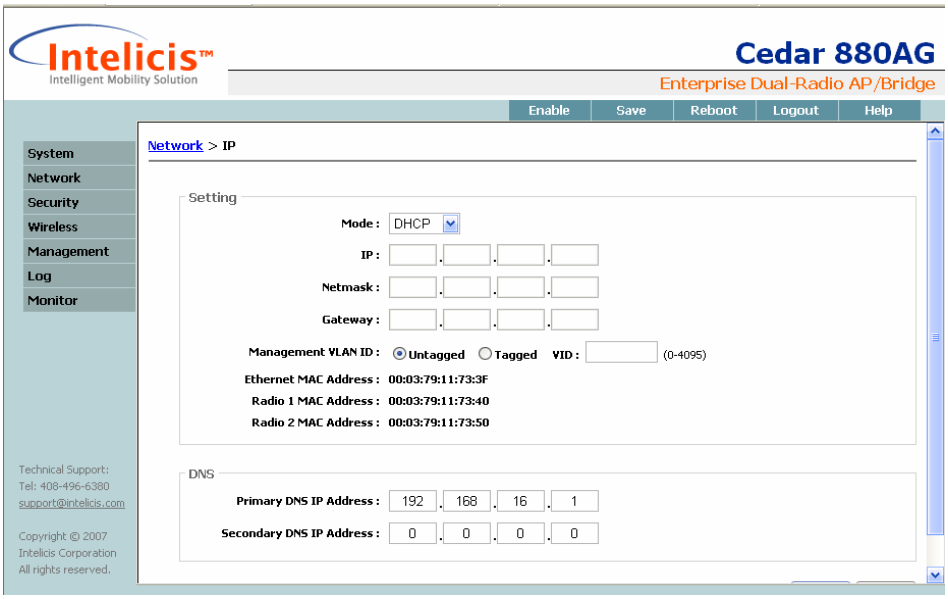
5.1.2 DHCP

Dynamic Host Configuration Protocol (DHCP) is a protocol for assigning dynamic IP addresses to computers on a network. Dynamic addressing simplifies network administration because the software keeps track of IP addresses. This means a new computer can be added to a network without the hassle of manually assigning it a unique IP address.

5.2 Web Interface

5.2.1 Network Setting

Select ***Network*** > ***IP*** to change network parameters.



Mode:

DHCP: If DHCP is chosen, a dynamic IP address is assigned to AP by the DHCP Server. In addition, the subnet mask, default gateway and DNS server addresses are also assigned. Because DHCP assigns the IP address dynamically, different IP addresses may be assigned to the AP after each reboot.

Static: In order to have full control of the IP address, the administrator may choose to use the Static IP. If Static mode is chosen, the administrator assigns the static IP address, subnet mask, default gateway and DNS server address for the AP. The AP will always have the same IP address after each reboot.

IP address

For DHCP mode: The DHCP Server assigns a dynamic IP address to the AP.
For Static mode: Enter the static IP address for the AP.

Netmask

For DHCP mode: The DHCP Server assigns a network mask to the AP.
For Static mode: Enter the network mask for the AP.

Gateway

For DHCP mode: The DHCP Server assigns a default gateway to the AP.
For Static mode: Enter the default gateway for the AP.

Management VLAN ID

By default, VLAN support is disabled. All packets sent by the AP are ***untagged***. To enable VLAN support, click ***tagged*** and enter a VID value between 0 and 4095. Before enabling VLAN support, the VLAN setting needs to be pre-configured on a VLAN-aware switch, such as the Intelicis Cypress 1024.

Primary or Secondary DNS

Optionally enter the primary or secondary Domain Name Server (DNS) IP address. DNS translates domain names into IP addresses. Using DNS, network users are allowed to use more descriptive names such as www.example.com rather than 198.105.232.4.

5.2.2 VLAN

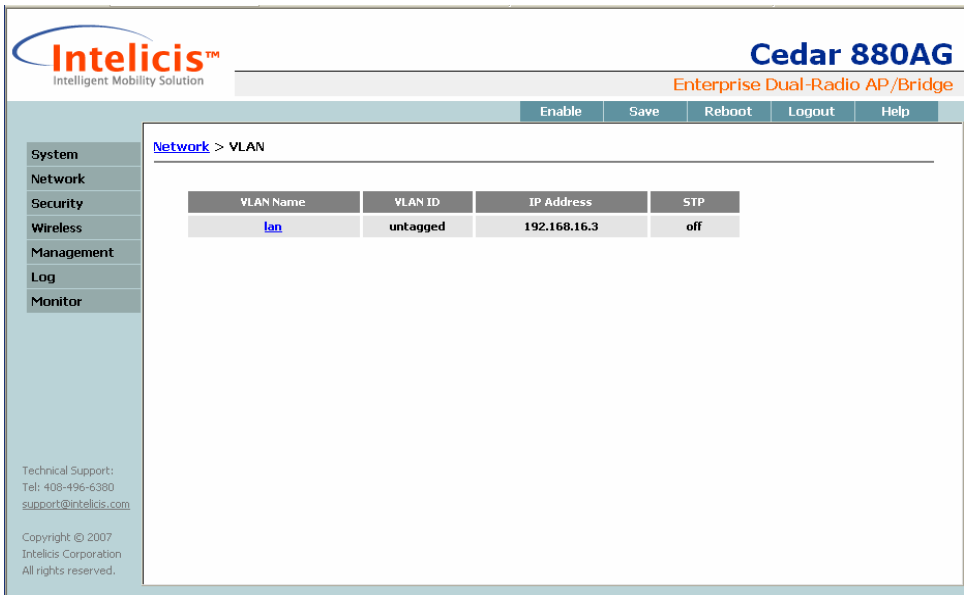
Select ***Network->VLAN*** to display the Virtual LANs in the system.

By default, VLAN support is disabled in Cedar. In this case, a single ***lan*** with the VLAN ID untagged is displayed.

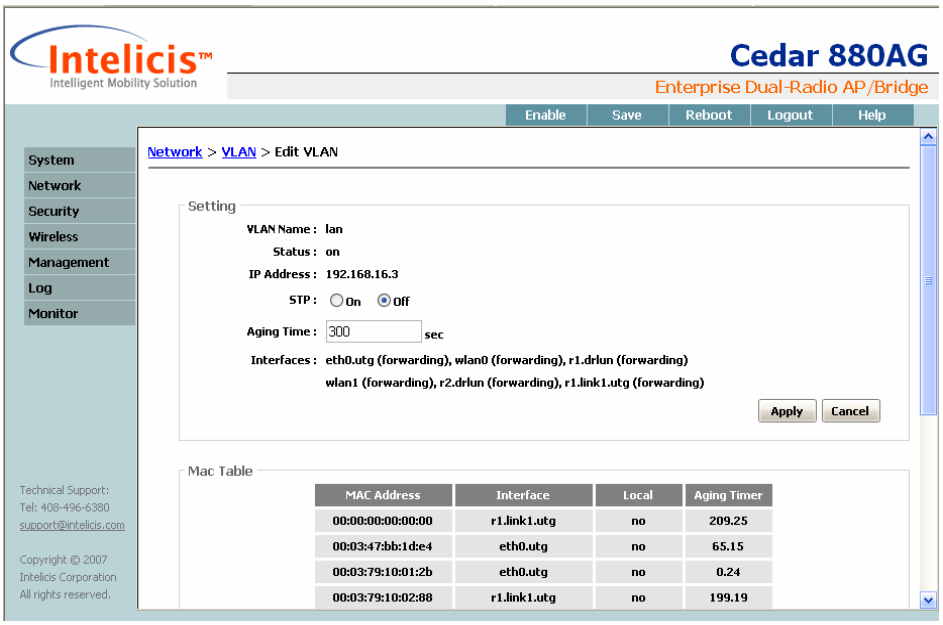
After the administrator enables VLAN support, additional VLANs are created by the system. The generated VLAN name has the following format:

vlan<vlan id>

Some examples would be vlan88 and vlan99.



Click the VLAN name to display detailed VLAN information.



STP

The 802.1d Spanning Tree Protocol (STP) is used to prevent interfaces from looping.

- **On**: STP is enabled. If a loop is detected, one of the connections will be disconnected.
- **Off:** (default) STP is disabled.

Aging Time

Specify how long an inactive MAC address remains in the MAC table before it is removed from the table. The default is 300 seconds (5 minutes).

Interfaces

Display a list of interfaces associated with this VLAN. The system initially comes with three interfaces: eth0 (Ethernet), wlan0 (wireless radio 1) and wlan1 (wireless radio 2). Enabling VLAN support automatically creates new interfaces. The status of each interface is one of the following:

- **Learning**: Interface is learning.
- **Forwarding**: Interface is actively forwarding packets.
- **Blocked**: Interface is blocked.

MAC Table

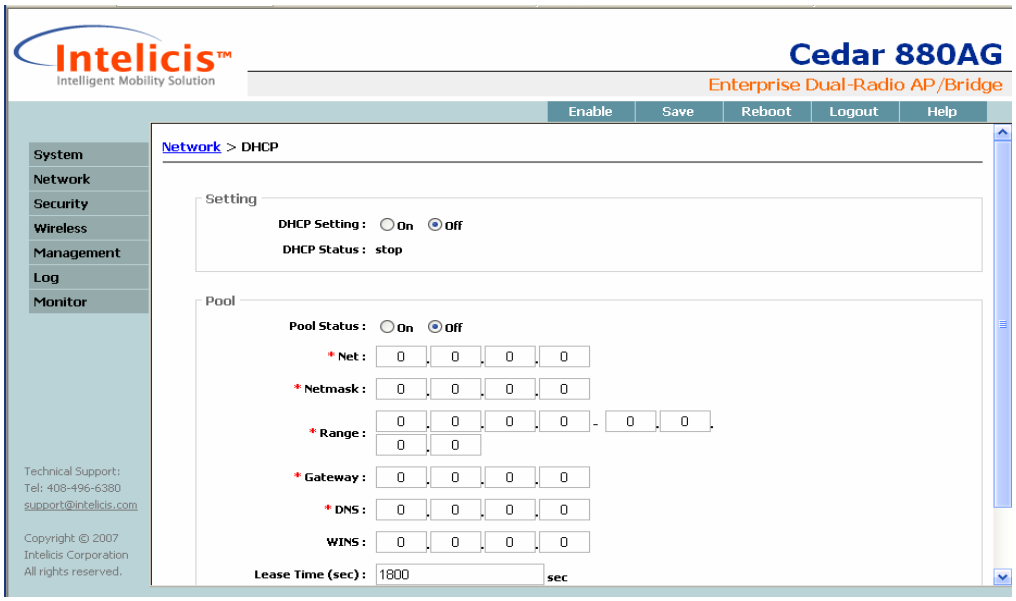
Displays a list of MAC addresses associated with this VLAN.

- **MAC Address**: MAC address of the client's machine
- **Interface**: The interface the client's machine is associated with
- **Local**: Whether or not the client's machine is associated with the AP locally

- **Aging time**: Number of seconds remaining before this entry is removed due to inactivity

5.2.3 DHCP

If DHCP is not available in your network, Cedar can be configured to assign dynamic IP addresses to computers on the network. Select ***Network>DHCP*** to perform this function.



DHCP Setting

On: Enable DHCP service.
Off: (default) Disable DHCP service.

Pool Status

The pool status should be turned on to enable DHCP service.

Net

Specify the subnet where you want the DHCP to be enabled, for example, 192.168.1.0.

Netmask

Specify the network mask for the subnet.

Range

Enter a range of IP addresses which are to be allocated for dynamic IP addresses only. Each time a DHCP request comes in; the DHCP server assigns an IP address from this range to its users.

Gateway
Enter the default gateway IP address which the DHCP server will assign to its users.

DNS
Enter the DNS IP address which the DHCP server will assign to its users.

WINS
Enter the Windows Internet Name Server IP address which the DHCP server will assign to its Windows users.

Lease Time
Enter how long the assigned IP address is valid for. The default is 1800 seconds (30 minutes).

5.3 Examples

5.3.1 Configure Static IP Address

1 Consult your ISP or IT department to acquire a static IP address, network mask, default gateway and DNS for your AP.

2 Click ***Network->IP*** from the Cedar web interface to modify the network settings.

3 Select ***Static*** as the network mode. The three parameters of IP, Network Mask and Gateway become enabled.

4 Enter the IP, Network Mask and Gateway parameters.

5 Optionally enter the DNS parameters.

6 Click ***Apply***.

7 The address change takes effect immediately. You will need to re-login using the new IP address to continue with the rest of the configuration.

8 Save the configuration.

5.3.2 Configure Management VLAN ID

1. Consult your IT department to acquire the VLAN ID setting. Make sure the device (e.g. switch) that the AP connects to will support VLAN. The VLAN ID needs to be pre-configured there.

2. Click ***Network->IP*** from Cedar web interface to modify the network settings.

3. Select ***Tagged***, and enter the VLAN ID.

4. The VLAN ID change takes effect immediately. You will need to change the port which the AP is using to a trunk port.

5. Save the configuration.

6 Security

This chapter contains information on the following topics:

- Configure RADIUS profile
- Configure 802.1x authentication
- Configure MAC authentication
- Configure Filter to block certain traffic

6.1 Overview

6.1.1 802.1x Authentication

Wireless Networks provide enormous flexibility, but they can also create potential security problems in the network. Extensible Authentication Protocol (EAP) is an authentication method that addresses the security issues in the wireless network. It is part of the 802.1x WLAN standards defined by IEEE.

The IEEE 802.1x specification uses three important terms. The user or client who wants to be authenticated is called a supplicant. The actual server doing the authentication, typically a RADIUS server, is called the authentication server. And the device in between, such as a wireless access point, is called the authenticator. One of the key points of 802.1x is that the authenticator can be small and simple - all of the processing is done by the supplicant and the authentication server. This makes 802.1x ideal for wireless access points, which are typically small and have limited memory and processing power.

Figure 6.1 illustrates a simple 802.1x authentication sequence.

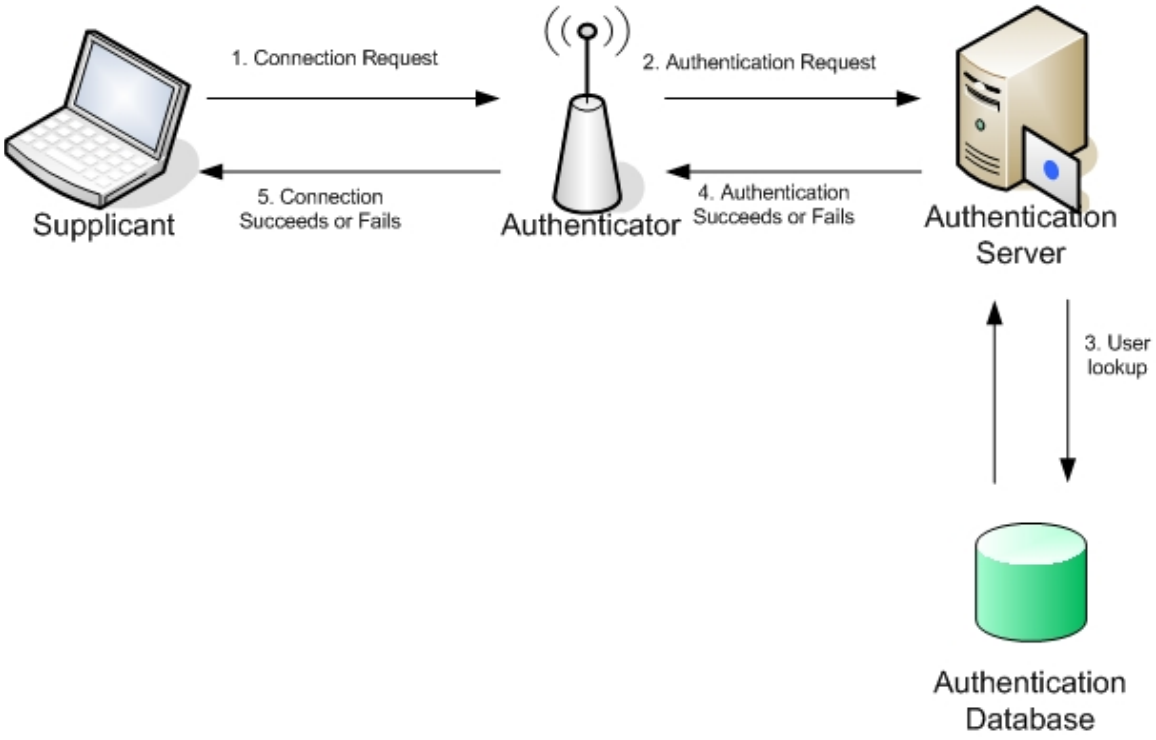


Figure 6.1 802.1x authentication sequence

1. The supplicant sends an authentication request containing identification and connection information to the authenticator.
2. The authenticator performs an initial negotiation with the supplicant to establish connection information (username, password, etc). The authenticator then forwards the user information in an authentication request to the RADIUS Server.
3. The RADIUS Server looks up the supplicant information in a local or remote RADIUS database.
4. If the information is found, the RADIUS server responds with a success message, which is then passed onto the supplicant. The authenticator now allows access to the network with possible restrictions based on attributes that came back from the authentication server. For example, the authenticator might switch the supplicant to a particular virtual LAN. If the information is not found, the RADIUS server responds with a reject message.
5. Based on the information it receives from the RADIUS server, the authenticator accepts or refuses the connection request.

6.1.2 MAC Authentication

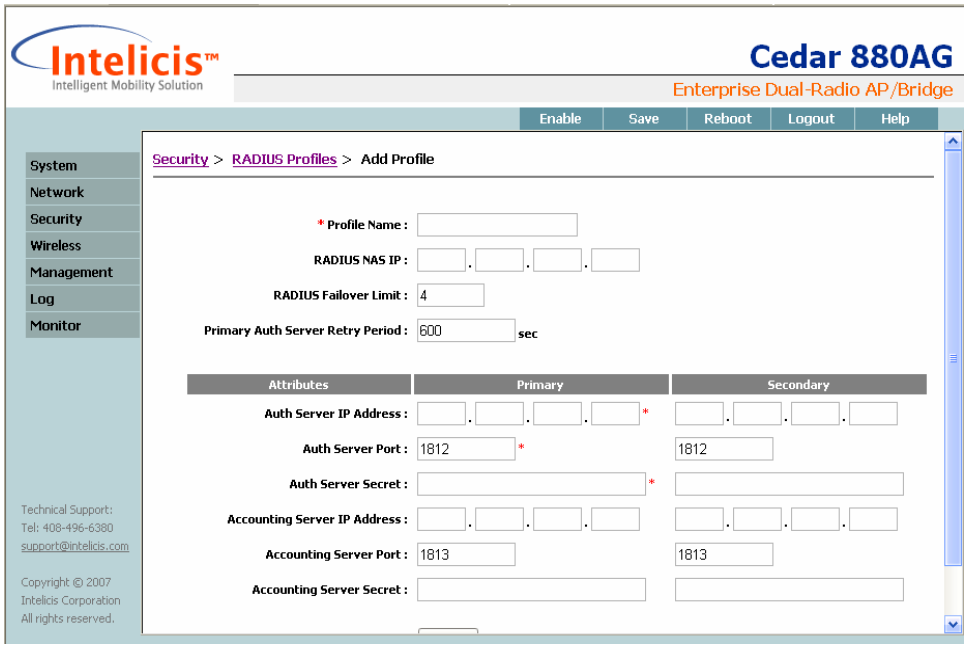
Although 802.1x authentication addresses security issue for the wireless network, its implementation may not be practical for every wireless devices (e.g. PDA) because it requires supplicant software to be installed on all wireless client machines.

MAC authentication provides an alternative solution. It controls wireless access to the network by storing a list of MAC addresses on a local or RADIUS server. This list of MAC addresses identifies the authorized stations that may access the wireless network.

6.2 Web Interface

6.2.1 RADIUS Profile

RADIUS profile is used to store RADIUS server information. Select ***Security->RADIUS*** to list the available RADIUS profiles in the system. Click the existing profile name to enter the editing screen or click the ***Add*** button to create a new one.



Profile Name

Enter a descriptive name for the profile. The maximum length is 15.

RADIUS NAS IP

When the authenticator (AP) sends the user connection information (username, password, etc) to the RADIUS server, it also sends its IP as an authenticator identifier. The NAS (Network Access Server) IP is optional. When specified, it can be used to identify where the authentication request is being sent from.

RADIUS Failover Limit

Cedar first tries to use the primary RADIUS Server for authentication. If the primary RADIUS server is down, Cedar retries for a number of times. It then

switches to the secondary RADIUS server for authentication. The parameter specifies the number of retries. The default is 4.

Primary Auth Server Retry Period

If the primary RADIUS server is down, Cedar will use the secondary RADIUS server for authentication. In the meantime, Cedar will periodically retry the primary RADIUS server and check if it is up again. The parameter specifies the retry period. The default setting is 600 seconds (10 minutes).

Auth Server IP Address

Enter the IP address for the primary and/or secondary authentication RADIUS server.

Auth Server Port

Enter the listening port number for the primary and/or secondary authentication RADIUS server. The default setting is 1812.

Auth Server Secret

Enter the secret for communicating with the primary and/or secondary authentication RADIUS server. If the Cypress RADIUS server is used, this secret must match the secret configured in the RADIUS Network Access Server (NAS).

Accounting Server IP Address

Enter the IP address for the primary and/or secondary accounting RADIUS server.

Accounting Server Port

Enter the listening port number for the primary and/or secondary accounting RADIUS server. The default setting is 1813.

Accounting Server Secret

Enter the secret for communicating with the primary and/or secondary accounting RADIUS server. If the Cypress RADIUS server is used, this secret must match the secret configured in the RADIUS Network Access Server (NAS).

6.2.2 802.1x Profile

The combination of 802.1x authentication profile and RADIUS profile are used to perform 802.1x authentication. Select ***Security->802.1x Authentication*** to list the available 802.1x profiles in the system. Click the existing profile name to enter the editing screen or click the ***Add*** button to create a new one.

Profile Name

Enter a descriptive name for the profile. The maximum length is 15.

Re-authentication

- **On**: Cedar will automatically re-authenticate the clients based on the re-authentication period parameter.
- **Off**: (default) Cedar will not automatically re-authenticate the clients.

Re-authentication Period

This parameter specifies the re-authentication timer in seconds. The default setting is 3600 seconds (60 minutes).

Dynamic WepKey Length

If dynamic WEP keys are used for data encryption, this parameter defines the length of the generated keys in bits. The default is 128 bits.

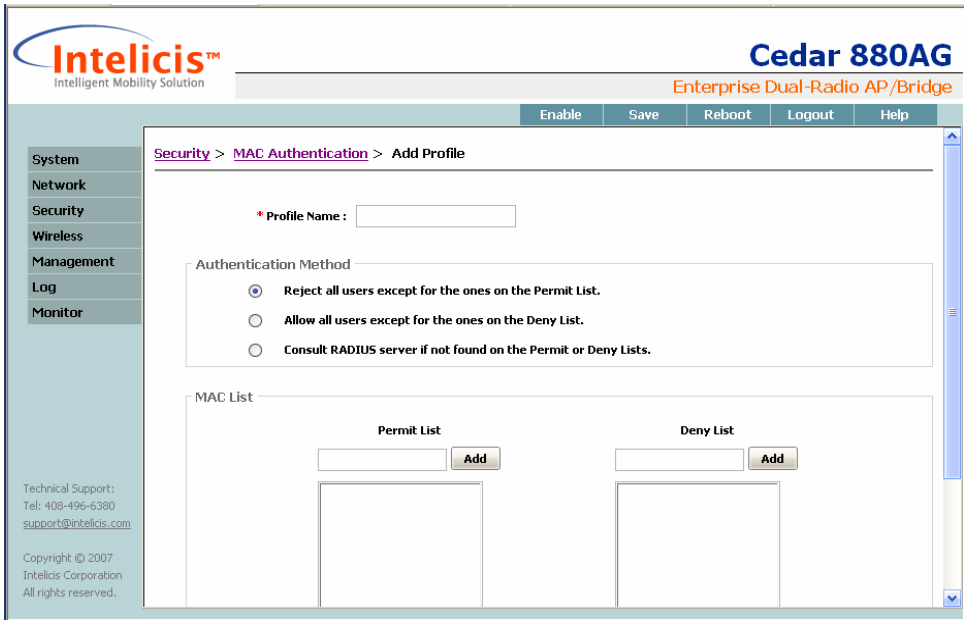
WebKey Update Interval

Dynamic WEP keys are regenerated based on a pre-defined interval. This parameter defines this interval in seconds. The default is 300 seconds (5 minutes).

6.2.3 MAC Profile

The MAC profile is used to store MAC authentication information. The MAC authentication profile can be used alone or combined with the RADIUS profile to perform MAC authentication. Select ***Security->MAC Authentication*** to list the available

MAC profiles in the system. Click the existing profile name to enter the editing screen or click the ***Add*** button to create a new one.



Profile Name

Enter a descriptive name for the profile. The maximum length is 15.

Authentication Method

- **Reject all users except for the ones on the Permit List.**
- **Allow all users except for the ones on the Deny List.**
- **Consult RADIUS Server if not found on the Permit or Deny Lists:** The client's MAC address is first checked against the Permit and Deny Lists. If it is on the Permit List, access is granted. If it is on the Deny List, access is denied. If the client's MAC address is on neither one of the lists, the RADIUS server is checked. If it is on the RADIUS server, access is granted, otherwise, access is denied.

Permit List

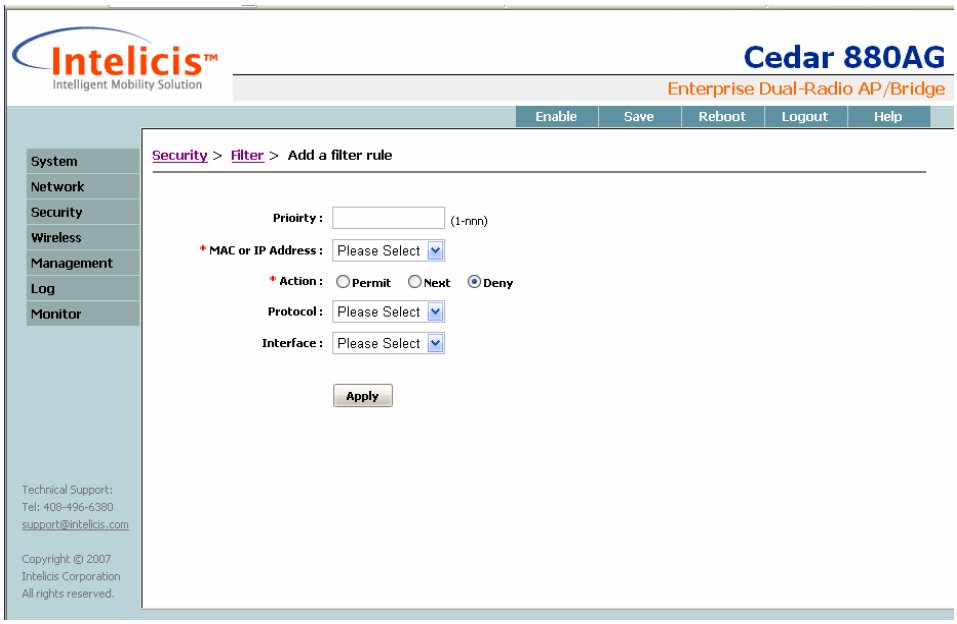
A local list of the entire MAC addresses which are to be permitted access.

Deny List

A local list of the entire MAC addresses which are to be denied access.

6.2.4 Filter

A filter may be used to block traffic from certain users. Select ***Security->Filter*** to list the available filters in the system. Click the existing filter name to enter the editing screen or click the ***Add*** button to create a new one.



Priority

All the incoming and outgoing packets will be checked against the filter rules based on their priority. Low number means high priority (e.g. 1 is the highest priority) and will be checked first.

When a condition is met (e.g. the IP address matched), action will be taken immediately (e.g. permit or deny). Otherwise, the AP continues checking using the rest of the filter rules.

MAC or IP Address

Specify the MAC or IP address to be filtered. “000000000000” means all MAC addresses. “0.0.0.0” means all IP addresses.

Action

Permit: Packets which match the filter rule will be accepted.
Next: Packets which match the filter rule will be examined by the immediate next rule for further checking.
Deny: Packets which match the filter rule will be dropped.

Protocol

Select a protocol to be filtered. Options are **TCP**, **UDP** or **ICMP**.

Interface

Select an interface to be filtered.

☞ Filter can be used to block traffic between different sub-nets or traffic to other APs. Filter does not block traffic within the same AP.

6.3 Examples

6.3.1 802.1x Authentication

1 Identify a RADIUS server to be used for 802.1x authentication. Write down its IP address and server secret code. Confirm the authentication port is 1812.

2 Create some 802.1x user entries in the RADIUS server. For example,

User Name: test1
Password: xxx
Type: EAP

3 Click ***Security->RADIUS*** from the Cedar web interface to display all the RAIDUS profiles.

4 Click ***Add*** to add a new profile. Enter the following sample data and use default for the rest of the parameters.

Profile Name: myRADIUS
Primary Auth Server IP Address: 192.168.1.1
Primary Auth Server Secret: xxxx

5 Click ***Apply***.

6 Click ***Security->802.1x Authentication*** from the Cedar web interface to display the entire 802.1 x authentication profiles.

7 Click ***Add*** to add a new profile. Enter the following sample data and use default for the rest of the parameters.

Profile Name: my8021x

8 Click ***Apply***.

9 Save the configuration.

6.3.2 MAC Authentication

1 Identify a RADIUS server to be used for MAC authentication. Write down its IP address and server secret code. Confirm the authentication port is 1812.

2 Create some MAC user entries in the RADIUS server. For example,

User Name: 000cf157b3bc
Password: <none>
Type: MAC

3 Click ***Security->RADIUS*** from the Cedar web interface to display all the RADIUS profiles.

4 Click ***Add*** to add a new profile. Enter the following sample data and use default for the rest of the parameters.

Profile Name: myRADIUS
Primary Auth Server IP Address: 192.168.1.1
Primary Auth Server Secret: xxxx

5 Click ***Apply***.

6 Click ***Security->MAC Authentication*** from the Cedar web interface to display all the MAC authentication profiles.

7 Click ***Add*** to add a new profile. Enter the following sample data and use default for the rest of the parameters.

Profile Name: myMAC
Authentication Method: Consult RADIUS Server if not found on the permitted or rejected MAC lists.

8 Click ***Apply***.

9 Save the configuration.

7 Wireless

This chapter contains information on the following topics:

- Configure Wireless Setting
- Configure WLAN
- Configure Radio 1 and 2
- Configure Bridge Link
- Configure Mesh

7.1 Overview

7.1.1 WLAN

Similar to the Virtual LAN concept, WLAN is a way to logically group wireless users into sub-networks. Each WLAN may implement a different security mechanism and has a different level of access to the network. The administrator can selectively enable a list of WLANs on the AP. A wireless user is allowed to access the wireless network by connecting to an AP which supports his assigned WLAN.

A RADIUS server can be used to enforce WLAN access control. When a wireless user connects to the AP using a WLAN, he may or may not be authorized to use that WLAN. During the authentication phase, the RADIUS server not only authenticates the user but also returns user attributes (e.g. the user's VLAN ID) to the authenticator (AP). The AP can subsequently determine whether to allow the user access to the wireless network.

7.1.2 Bridge Link

Bridge Link is a cost effective way to connect Ethernet LANs from difference location using wireless devices. As described in Chapter 1, bridge link can work in a point-to-point or point-to-multipoint topology. You can use either topology to support:

- Single VLAN network: untagged packets are sent across the wireless bridge link.
- Multiple VLANs network: tagged packets are sent across the wireless bridge link.

Figure 7.1 illustrates a point-to-point bridge link topology supporting multiple VLANs network.

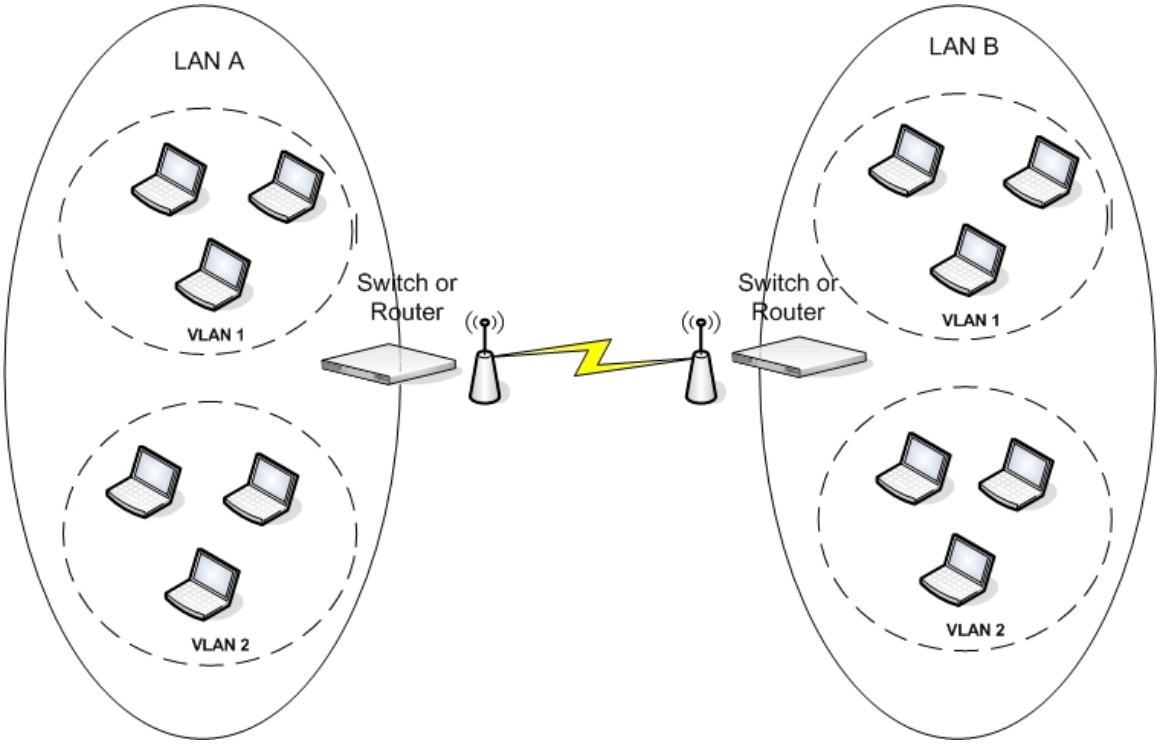
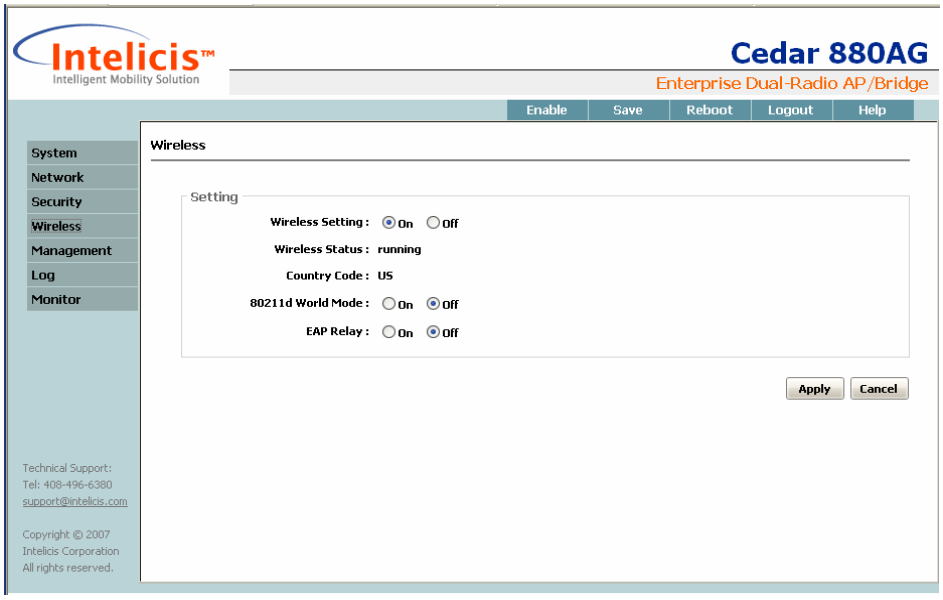


Figure 7.1 Bridge Link in Multiple VLANs Network

7.2 Web Interface

7.2.1 Wireless Setting



Wireless Setting

On: (default) Enable the wireless service.
Off: Disable the wireless service.

Wireless Status

Display the status of the wireless service.

Country Code

Display the AP's country code. The country code is set during the manufacture stage and can not be modified by the users.

80211d World Mode

If world mode is turned on, the AP broadcasts its local settings, such as the country code. The default setting is off.

EAP Relay

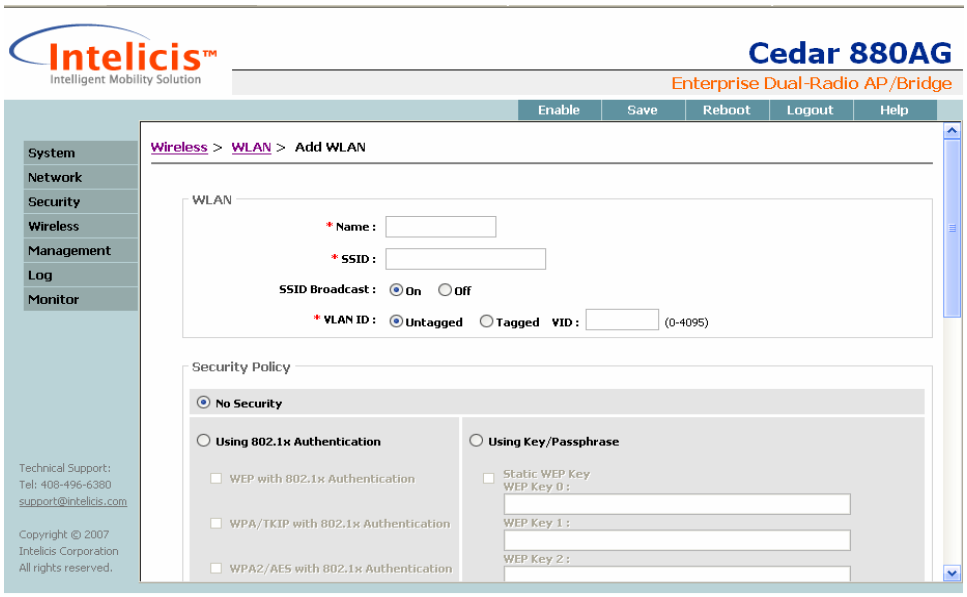
If EAP relay is turned on, the AP does not perform any EAP related authentication. Instead, the AP relays the requests to a wireless switch and relies on the switch to perform this function. The default setting is off.

7.2.2 WLAN

WLANs logically group users by their functionality. Each group may have a different access privilege, security level and encryption method. Select ***Wireless->WLAN*** to list the available WLANs in the system. Click the existing WLAN name to enter the editing screen or click the ***Add*** button to create a new one.

After a WLAN is created, add it to either one of the Radios to take effect. The system comes with the following two default WLANs:

- **Intelicis-a**: used by Radio 1
- **Intelicis-b**: used by Radio 2


Intelicis™
Intelligent Mobility Solution
Cedar 880AG
Enterprise Dual-Radio AP/Bridge
Enable
Save
Reboot
Logout
Help
System
Network
Security
Wireless
Management
Log
Monitor
Wireless > WLAN > Add WLAN
WLAN
* Name :
* SSID :
SSID Broadcast : On Off
* VLAN ID : Untagged Tagged VID : (0-4095)
Security Policy
No Security
Using 802.1x Authentication
WEP with 802.1x Authentication
WPA/TKIP with 802.1x Authentication
WPA2/AES with 802.1x Authentication
Using Key/Passphrase
Static WEP Key
WEP Key 0 :
WEP Key 1 :
WEP Key 2 :
Technical Support:
Tel: 408-496-6380
support@intelicis.com
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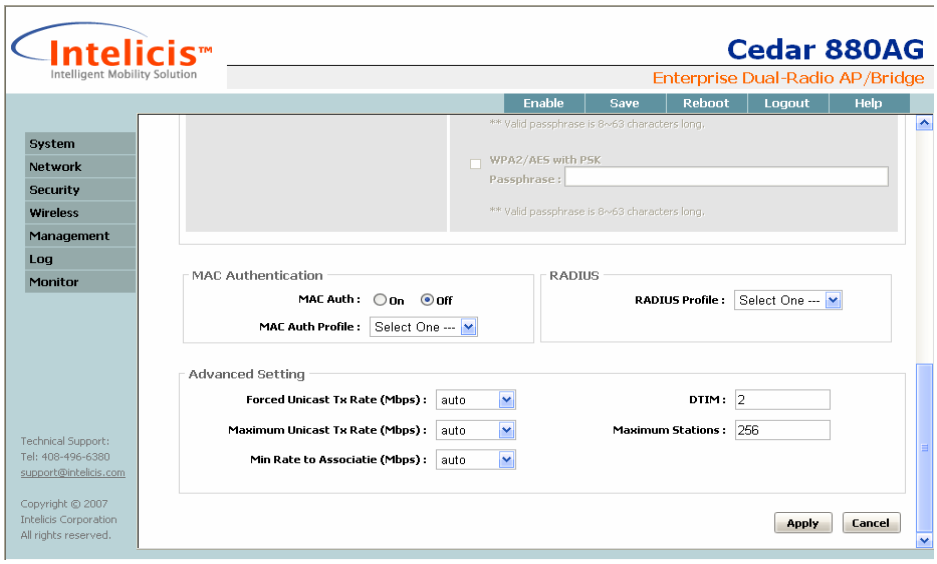


Name

Enter a descriptive name for the wireless network. The maximum length is 12.

SSID

SSID stands for Service Set Identifier, a 32 character unique identifier used by mobile users to connect to a wireless network.

SSID Broadcast

- **On**: (default) The SSID configured on the access point will be broadcast to all wireless devices within range.
- **Off**: The automatic SSID broadcast feature is disabled.

VLAN ID

Specify whether the VLAN ID tag will be used.

- **Untagged**: (default) The wireless packets of this WLAN are untagged.
- **Tagged & VLAN ID**: The wireless packets of this WLAN are tagged with the specified VLAN ID.

No Security

Wireless clients will establish association with the access point using the **Open** mode and **no** encryption implementation.

Using 802.1x Authentication

A wireless client will authenticate himself via RADIUS Server before using the wireless network. The administrator must configure a RADIUS profile which contains the RADIUS location and password information, as well as an 802.1x

profile which contains 802.1x specific information. The administrator may select one, two or all three of the association mode and encryption method combinations listed below:

- **Dynamic WEP with 802.1x authentication**
  - association mode is **Open**
  - encryption method is **Dynamic WEP**
- **WPA/TKIP with 802.1x authentication**
  - association mode is Wi-Fi Alliance's **WPA**
  - encryption method is **TKIP**
- **WPA2/AES with 802.1x authentication**
  - association mode is Wi-Fi Alliance's **WPA2**
  - encryption method is **AES**

Using Key/Passphrase

The authentication mechanism used between wireless clients and the wireless network is a pre-configured key or passphrase. The key or passphrase configured on the client's machine must match those stored on the AP. The administrator may choose one, two or all three of the association mode and encryption method combinations listed below:

- **Static WEP key**
  - association mode is **Open**
  - data encryption method used is **Static WEP** key

  You must choose a default WEP Key index and fill in the WEP key.

- **WPA/TKIP with PSK**
  - association mode is Wi-Fi Alliance's **WPA**
  - encryption method is **TKIP**.

  You must fill in the WPA Pre-Shared-Key Passphrase.

- **WPA2/AES with PSK**
  - association mode is Wi-Fi Alliance's **WPA2**
  - encryption method is **AES**

  You must fill in the WPA2 Pre-Shared-Key Passphase.

MAC Auth

- **On**: wireless clients are required to authenticate using their MAC address. You must choose a MAC authentication profile to be used for authentication.
- **Off**: (default) No MAC authentication is performed.

MAC Auth Profile

Specify the MAC authentication profile to be used for authentication. You must have already configured a MAC authentication profile in the system. If the MAC authentication method requires the RADIUS Server, you will also need to specify the RADIUS profile.

RADIUS Profile

Specify the RADIUS profile to be used for 802.1x or MAC authentication.

Forced Unicast Tx Rate

This parameter allows you to configure a transmission rate (in 100 kbps) that will be used for all unicast frames. The rate must be one of the AP's supported rates.

Maximum Unicast Tx Rate

This parameter allows you to set a maximum limit on the transmission rate to be used. By default, this option is disabled, which allows any supported rate to be used.

Min Rate to Associate

This parameter allows you to set a minimum rate required for association. If a client station does not support any rates equal to or greater than this rate, the association will be rejected.

DTIM

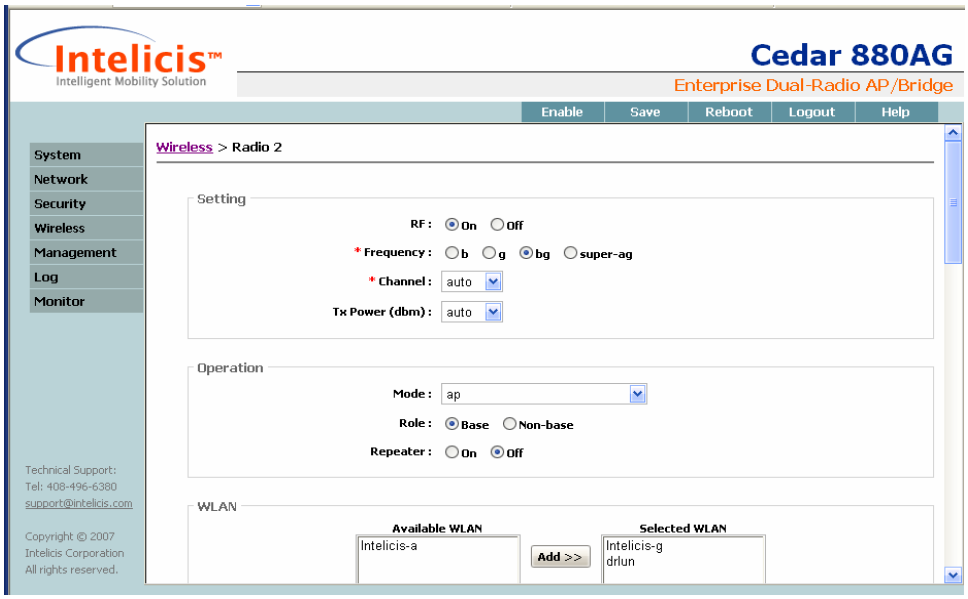
The Delivery Traffic Indication Message (DTIM) is used by the AP to indicates which client station, currently sleeping in low-power mode, have data buffered on the access point waiting for pick-up. DTIM should be left at 2, the default value. This parameter supports a range between 1 and 255.

Maximum Stations

This parameter specifies the maximum number of stations which can associate with the AP. The default is 256.

7.2.3 Radio

Select ***Wireless->Radio 1*** or ***Wireless->Radio 2*** to display radio specific parameters for radio 1 or 2. Except for WLAN and Bridge Link, most of the parameters can be left with their default values.


Intelicis™
Intelligent Mobility Solution
Cedar 880AG
Enterprise Dual-Radio AP/Bridge
Enable
Save
Reboot
Logout
Help
System
Network
Security
Wireless
Management
Log
Monitor
Wireless > Radio 2
Setting
RF : On Off
* Frequency : b g bg super-ag
* Channel : auto
Tx Power (dbm) : auto
Operation
Mode : ap
Role : Base Non-base
Repeater : On Off
WLAN
Available WLAN
Selected WLAN
Intelicis-a
Add >>
Intelicis-g
drlun
Technical Support:
Tel: 408-496-6380
support@intelicis.com
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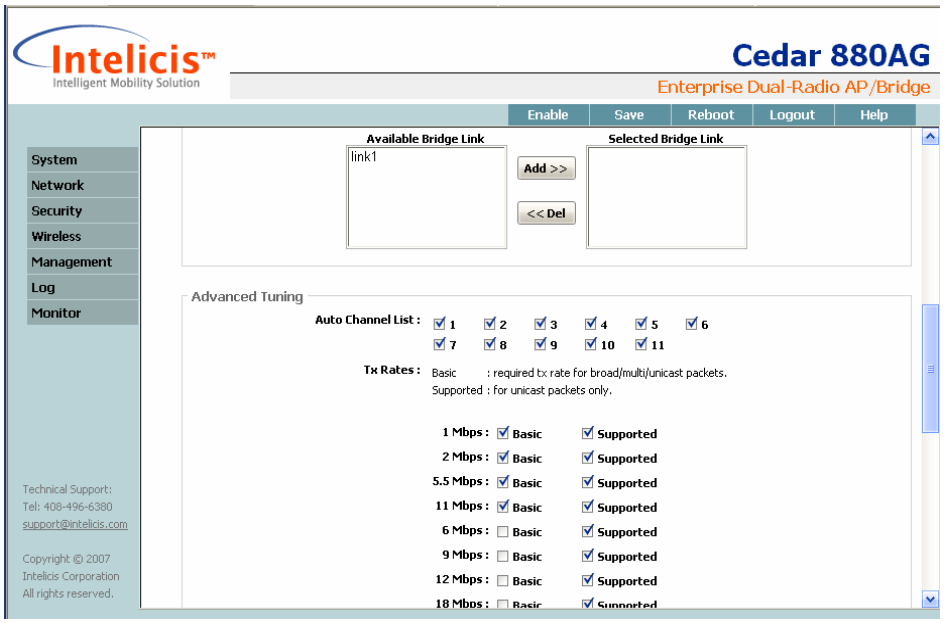
Intelicis™
Intelligent Mobility Solution
Cedar 880AG
Enterprise Dual-Radio AP/Bridge
Enable
Save
Reboot
Logout
Help
System
Network
Security
Wireless
Management
Log
Monitor
Available Bridge Link
Selected Bridge Link
link1
Add >>
<< Del
Advanced Tuning
Auto Channel List : 1 2 3 4 5 6 7 8 9 10 11
Tx Rates : Basic : required tx rate for broad/multi/unicast packets.
Supported : for unicast packets only.
1 Mbps : Basic Supported
2 Mbps : Basic Supported
5.5 Mbps : Basic Supported
11 Mbps : Basic Supported
6 Mbps : Basic Supported
9 Mbps : Basic Supported
12 Mbps : Basic Supported
18 Mbps : Basic Supported
Technical Support:
Tel: 408-496-6380
support@intelicis.com
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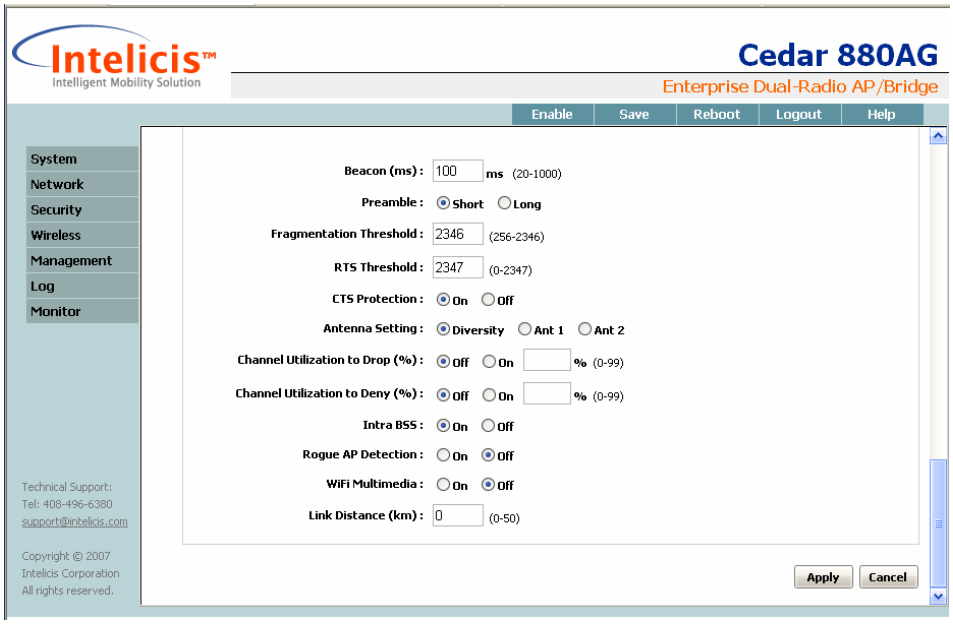


RF

Enable or disable the radio.

- **On:** the default setting
- **Off:** disables the radio

Frequency

Select one of the communication modes between wireless clients and the Access Point. Radio 1 operates in frequency **a or super-ag**. Radio 2 operates in frequency **b**, **g**, **bg or super-ag**.

- **a:** The default setting for Radio 1.
- **b:** The radio supports 802.11b standard only.
- **g:** The radio supports 802.11g standard only.
- **bg:** The default setting for Radio 2. Choose bg if you want to support both 802.11b and 802.11g devices.
- **super-ag:** Enabling Super AG provides better performance by increasing radio throughput.

Channel

Select a channel for the AP. If **auto** is selected, the AP automatically chooses a relatively unused channel. The administrator can specify a list of "preferred" channels using Auto Channel List that you wish the AP to scan first. Channels not in the Auto Channel List will not be chosen by the AP.
If the administrator wants to manually set the channel, he needs to ensure that nearby devices do not use the same channel.

If bridge link is configured, all bridge links need to communicate on the same channel.

- **Auto:** the default setting. It allows the AP to select a free or relatively unused communication channel. Channels in the Auto Channel List are preferred channels and will be scanned first.
- **1-14:** used for frequencies b, g, and bg
- **36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 149, 153, 157, 161, 165:** used for frequency a
- **40, 48, 56, 153, 161:** used for frequency super-ag (radio 1)
- **6:** used for frequency super-ag (radio 2)

☞ The channel regulation varies for every country. AP only allows you to set the channel that is legal in your country.

Transmit Power

Under certain circumstances, you may want to reduce the transmit power. An example would be when two radios are transmitting and receiving on nearby channels. To prevent one radio from interfering with the other, you may want to reduce its power.

- **Auto:** the default setting
- **1-20 dbm**

Mode

Select one of the operating modes for AP. The AP can operate as a regular AP, a Bridge or both.

AP: The AP operates as a regular access point.
BRGLNK: The AP operates as a Bridge.
AP, BRGLNK: The AP operates as both AP and Bridge.

Role

In a point-to-point or point-to-multipoint bridge link environment, one of the bridges has to be the base bridge. The rest of the bridges which associate with the base bridge become non-base bridges.

Base: The AP operates as a base bridge.
Non-Base: The AP associates with the base bridge.

Repeater

A repeater is not connected to a wired LAN. When an AP is configured as a repeater, its Ethernet port does not function. It has to reply on other Bridge or AP to forward packets.

On: Enable repeater mode.
Off: The default setting.

WLAN

- Add a WLAN to this Radio from the available WLAN list.
- Delete a WLAN from this Radio.

Bridge Link

- Add a Bridge Link to this Radio from the available Bridge Link list.
- Delete a Bridge Link from this Radio.

Auto Channel List

Auto Channel List is a list of preferred channels that the administrator wishes the AP to scan first when channel is set to "Auto".

- **1-14:** used for frequencies b, g, and bg
- **36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161, 165:** used for frequency a

Tx Rates

Select a frequency allows the AP to automatically set the default basic and supported rates. The user can then further fine tune the rates.

- **6, 9, 12, 18, 24, 36, 48, 54:** for frequency a
- **1, 2, 5.5 or 11:** for frequency b
- **6, 9, 12, 18, 24, 36, 48, 54:** for frequency g
- **1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48 or 54:** for frequency bg

Beacon

Beacon frames are transmitted by an AP at regular intervals to announce the existence of the wireless network. This parameter has a range of 20 to 1000 ms. The default setting is to send a beacon once every 100 ms.

Preamble

The preamble is used to allow stations to synchronize with the access point signal.

- **Long:** The long preamble uses the legacy 802.11 1 and 2 Mbps DSSS header.
- **Short:** The short preamble is provided to improve the efficiency of the network's throughput.

Fragmentation Threshold

The fragmentation threshold limits the size of packets transmitted on the network. If a packet exceeds the threshold, packet will be fragmented and sent as multiple frames. The range is 256 to 2346. The default setting is 2346.

RTS Threshold

RTS/CTS (Request to Send/Clear to Send) are used to control station access to the AP. A station initiates the process by sending a RTS. The AP receives the RTS and responds with a CTS. The station must receive a CTS frame before sending data. The range is 0 to 2347. When set to 2347 (the default setting), RTS is disabled.

CTS Protection

See description in RTS threshold.

- **On**: The default setting.
- **Off**: Disable CTS protection.

Antenna Setting

Antenna diversity improves performance of the AP by automatically selecting the best antenna for signal reception and transmission.

- **Diversity**: (default) Enable antenna diversity.
- **Ant1**: Always uses antenna 1.
- **Ant2**: Always uses antenna 2.

Channel Utilization to Drop

This load balancing feature attempts to maintain a useable throughput for a particular channel.

- **Off**: The default setting.
- **On**: Specify the parameter in percentage. If the air time related load is greater than the given threshold, disassociate a station. Stations that are sleeping in power-save mode are disassociated first.

Channel Utilization to Deny

This load balancing feature attempts to maintain a useable throughput for a particular channel.

- **Off**: The default setting.
- **On**: Specify the parameter in percentage. If the air time related load is greater than the given threshold, new stations are not allowed to associate with the AP.

Intra BSS

For security reasons, sometimes the administrator may need to disable communication between wireless clients.

- **On**: The default setting.
- **Off**: The AP blocks communication between wireless clients. Data traffic is allowed between the AP and its wireless clients and wired devices on the network, but not among wireless clients.

Rogue AP Detection

Enable/disable rogue AP detection.

- **Off**: The default setting.
- **On**: Enable rogue AP detection.

WiFi Multimedia

Quality of Service (QoS) is used to enhanced throughput and performance for time sensitive traffic such as voice, video and streaming data. Cedar's QoS support is based on the Wireless multimedia (WMM) standards.

- **Off**: The default setting.
- **On**: Enable WiFi multimedia support.

Link Distance

The typical distance between the wireless clients and AP is less than 1 kilometer (km). If your wireless network covers a bigger area, you may need to adjust this parameter. Increasing link distance automatically increases the packet acknowledge timeout period. This will impact the overall wireless network performance. The default setting is 0 (less than 1 km).

7.2.4 Bridge Link

A Bridge Link can greatly ease the difficulties involved in physically wiring LANs from different locations by connecting them wirelessly.

Select ***Wireless->Bridge Link*** to list the available Bridge Links in the system. Click the existing Bridge Link name to enter the editing screen or click the ***Add*** button to create a new one.

After a Bridge Link is created, add it to either one of the Radios in order for it to take effect.

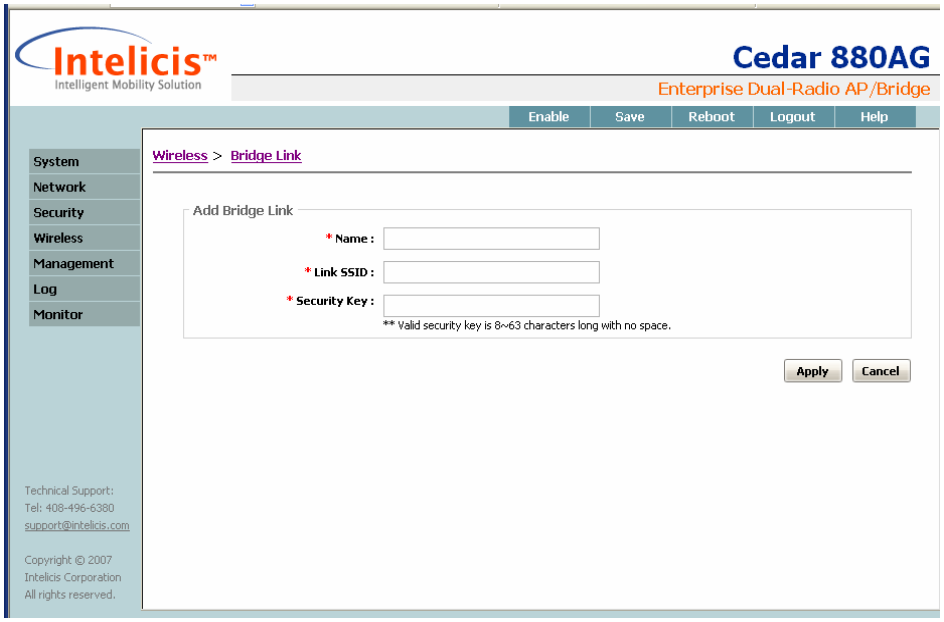
☞ For performance reasons, it is recommended that the Bridge Link to be added onto Radio 1. Radio 1 usually has less traffic and less interference.

☞ All Bridge Links must be configured to use the same radio channel. Auto channeling is not allowed.

☞ On the Radio where the Bridge Link is being added, the security policy of the primary (the first) WLAN must be WPA2/AES.

Make sure the signal quality of the Bridge Link is adequate because it greatly impacts the performance. Once a link is established, its signal quality and other statistics can be viewed by selecting *Monitor->Wireless Link*. Follow the steps below to improve the signal strength of the WDS link:

- The two APs should be placed such that there are minimal objects between them. Any steel or wood objects absorb RF energy. You should also consider radio interference from devices such as microwave ovens or other APs.
- Scan the channel activities to select a channel that is least busy.
- Adjust the power level setting when the distance of the two APs changes; the further the distance, the higher the power.
- Adjust the link distance parameter as you see fit.



Name

Enter a descriptive name for the Bridge Link. The maximum length is 7.

Link SSID

Enter the SSID to be used between the base and non-base bridges. Each bride link should have its own SSID configured.

Security Key

Enter the security key used between the base and non-base bridges. The security key should be 8 to 63 characters long.

7.2.5 Mesh

In a mesh network, access points self configure and maintain their connectivity with adjacent access points via reliable, high-speed wireless links. When selecting an adjacent AP, factors such as signal strength and location are calculated to determine the most efficient path.

Select ***Wireless->Mesh*** to display mesh network setting.

☞ All changes are required to save configuration and reboot to take effect.

Setting

On: Enable the mesh function.
Off: (default) Disable the mesh function.

Radio

Choose a radio to perform the mesh function.

Role

In a mesh network, at least one access point has to be the root. The rest of the APs maintain wireless links with the root AP or other non-root AP.

Root: The root AP usually has the direct connection with the corporate network.
Non-Root: The non-root AP maintains wireless links with the root AP or other non-root AP.

Channel

The root AP selects its own channel. The non-root AP uses whatever channel that is chosen by the root AP.

Minimum Link SNR

When a non-root AP selects an adjacent AP to establish wireless link, the signal strength is one of the major factor. Any adjacent AP with link quality below Minimum Link SNR will not be used to establish mesh link.

7.3 Examples

7.3.1 WLAN with WPA and 802.1x Authentication

You should already have a RADIUS profile and an 802.1x authentication profile configured in the system.

1 Click ***Wireless->WLAN*** from the Cedar web interface to display all the WLANs.

2 Click ***Add*** to add a new profile. Enter the following sample data and use defaults for the remainder of the parameters.

Name: myWLAN
SSID: myWLAN

3 Select **Using 802.1x Authentication** for security policy. The parameters in this sub-section become enabled.

4 Click **WPA/TKIP with 802.1x Authentication,** and select an 802.1x Auth Profile from the list box.

5 Select a RADIUS Profile from the list box.

6 Click ***Apply***.

7 Click ***Wireless->Radio 2*** from the Cedar web interface to display radio 2 parameters.

8 Click **myWLAN** from the available WLAN list box and add it to the selected WLAN list box.

9 Click ***Apply***.

10 Save the configuration.

7.3.2 WLAN with WEP and MAC Authentication

You should already have a RADIUS profile and an MAC authentication profile configured in the system.

1 Click ***Wireless->WLAN*** from the Cedar web interface to display all the WLANs.

2 Click ***Add*** to add a new profile. Enter the following sample data and use defaults for the remainder of the parameters.

Name: myWLAN
SSID: myWLAN

3 Select **Using Key/Passphrase** for security policy. The parameters in this sub-section become enabled.

4 Click **Static WEP Key,** and enter a 5-, 13- or 16-character WEP key in the WEP Key 0 field. Make sure to use the same WEP key when configuring the wireless client software.

5 Turn MAC authentication on and select an MAC Auth Profile from the list box.

6 Select a RADIUS Profile from the list box.

7 Click ***Apply***.

8 Click ***Wireless->Radio 2*** from the Cedar web interface to display radio 2 parameters.

9 Click **myWLAN** from the available WLAN list box and add it to the selected WLAN list box.

10 Click ***Apply***.

11 Save the configuration.

7.3.3 Bridge Link

1 Click ***Wireless->Bridge Link*** from the Cedar web interface to display all the Bridge Links.

2 Click ***Add*** to add a new Bridge Link. Enter the following sample data and use default for the remainder of the parameters.

Name: myLink

3 Enter Link SSID (the remote Bridge should use the same SSID).

4 Enter a security key which is 8 to 63 characters long (the remote Bridge should configure with the same security key).

5 Click ***Apply***.

6 Click ***Wireless->Radio 1*** from the Cedar web interface to display radio 1 parameters.

7 Change channel to a fixed channel (the remote Bridge should use the same channel).

8 Make sure the first WLAN on radio 1 uses WPA2/AES for security.

9 Select brglnk or ap,brglnk for mode.

10 Select base for role (the remote Bridge should use non-base role).

11 Click **myLink** from the available Bridge Link list box and add it to the selected Bridge Link list box.

12 Click ***Apply***.

13 Save the configuration.

7.3.4 Bridge Link with Multiple VLANs

1 Follow instructions in Chapter 5.3.2 to configure management VLAN ID.

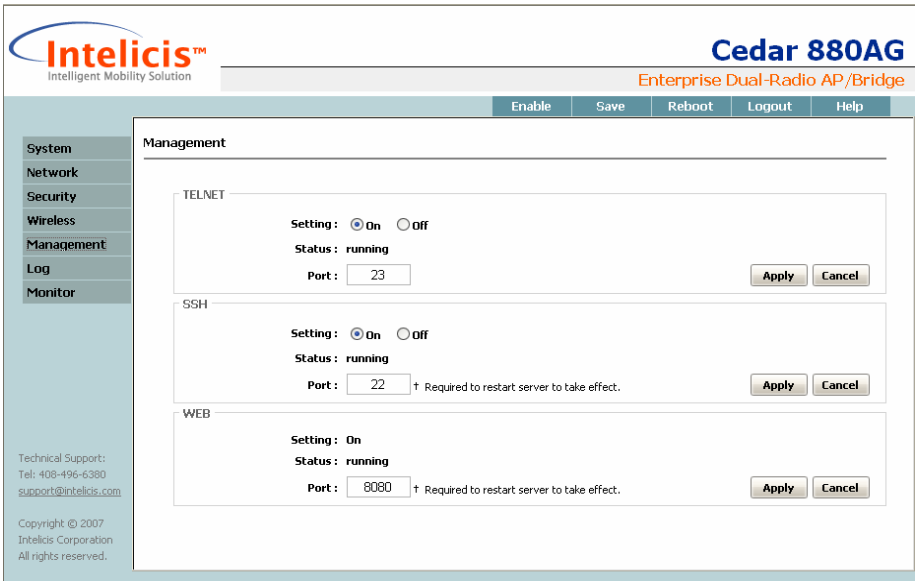
2 Follow instructions in Chapter 7.3.1 or 7.3.2 to create a WLAN. Assign a VLAN ID to the WLAN. When the WLAN is added to Radio 1 or 2, the system automatically creates VLAN for you. Select ***Network->VLAN*** to display all the Virtual LANs in the system

3 Follow instructions in Chapter 7.3.3 to create a bridge link. Add the WLAN created previously to the Radio where the bridge link is being added. This step makes bridge link work as a VLAN trunk port for the VLAN.

8 Management

8.1 Management Setting

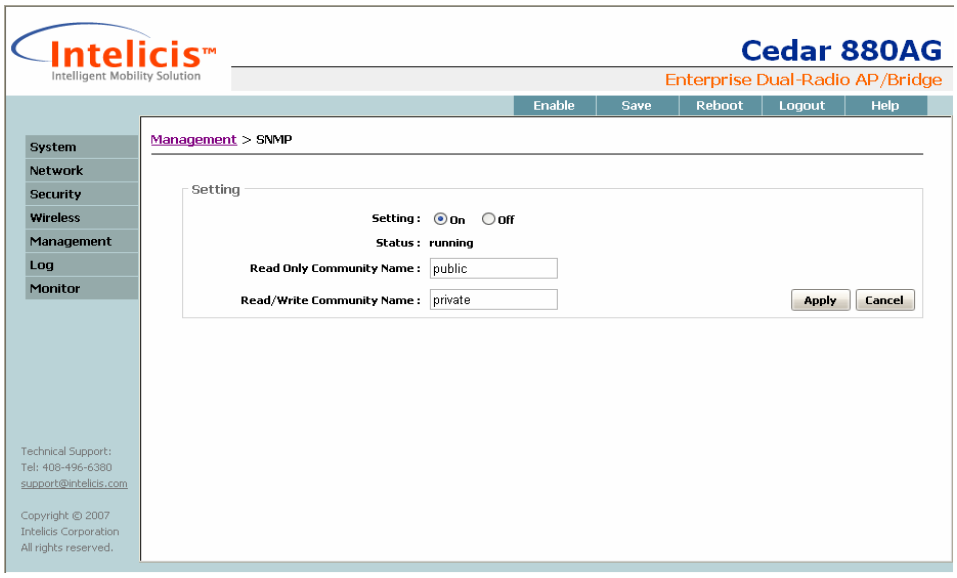
The Cedar Command Line Interface is available through a serial console port, telnet or SSH. The Cedar Web Interface is accessible from any web browser on the network. The administrator can modify the telnet, SSH or Web interface setting by selecting ***Management*** from the menu**.**



8.2 SNMP

In addition to the command line interface and web interface, the Cedar access point can be managed through SNMP (Simple Network Management Protocol). One of the applications that use SNMP to manage the Cedar AP is the Intelicis Multi-Service Wireless Switch, Cypress 1024.

To display or change the setting of SNMP, select ***Management -> SNMP***.



Setting

Enable or disable SNMP.

Read Only Community Name

The SNMP community name for read only (GET) operations. The default value is "public".

Read/Write Community Name

The SNMP community name for read and write (SET) operations. The default value is "private".

8.3 Serial Over IP

With Serial over IP enabled, any serial port device connected to Cedar AP could be accessed from anywhere over the wireless network as if it was attached to local PC.

To display or change the setting of Serial over IP, select ***Management -> Serial***.

Mode

Console (default): Disable serial over IP.
Network: Enable serial over IP.

Baud Rate

The transmission rate between serial devices.

Data Bit

The number of data bits being transmitted.

Stop Bit
The number of stop bits to mark the last part of a character frame.

Parity
Optional parity bit that follows the data bits.

Flow Control
Flow control mechanism.

Network Role
The AP is operated as a client or server.

Server IP
The Serial over IP server's IP address.

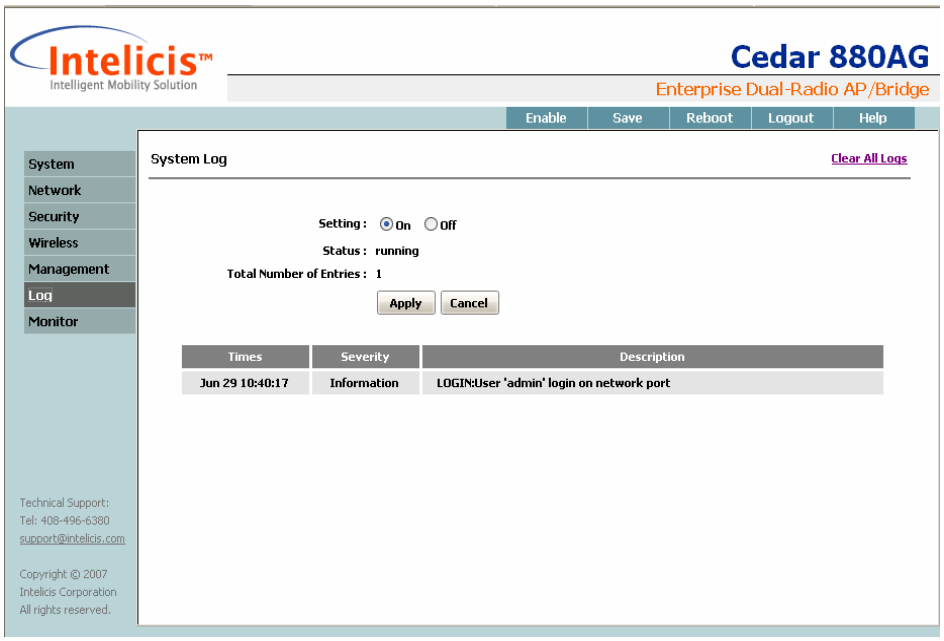
Server Port
The Serial over IP server's port number.

Rx Char Timeout
Character received timeout period.

Rx Char Delimiters
Character received delimiter.

9 Log

The Cedar log file can be viewed by selecting ***Log*** from the menu.



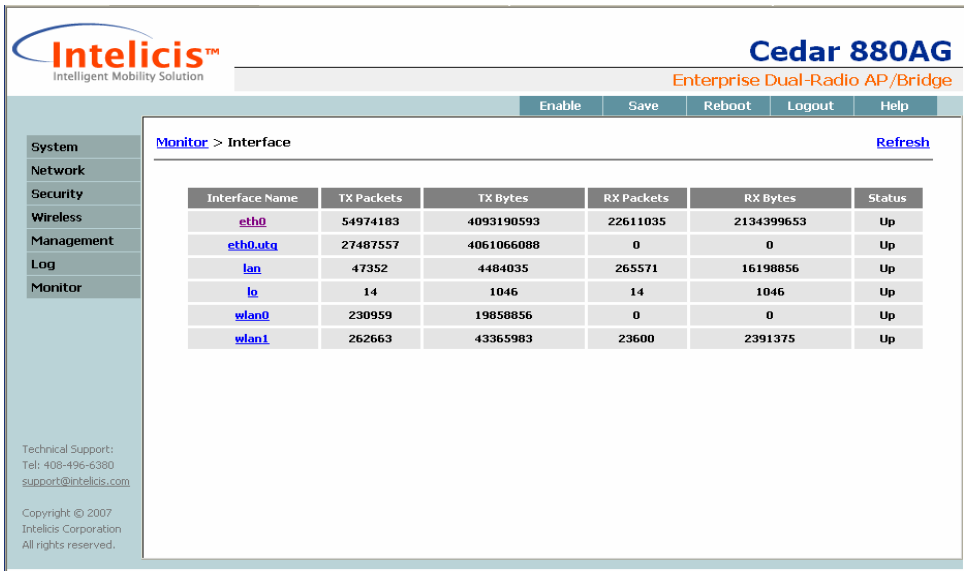
10 Monitor

This chapter contains information on the following topics:

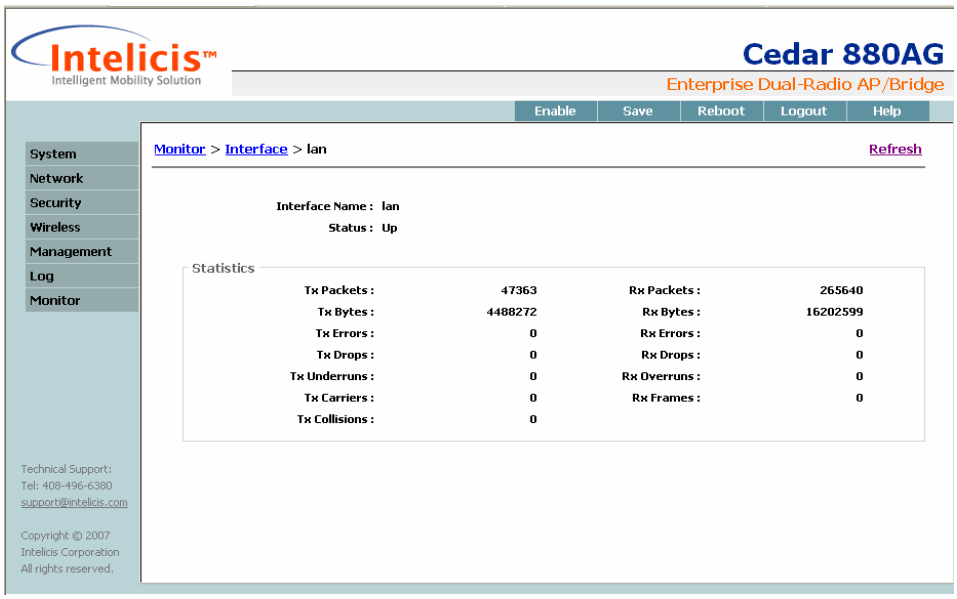
- Monitor interfaces
- Monitor radios
- Monitor Rogue APs
- Monitor wireless users
- Monitor wireless links
- Monitor wireless mesh

10.1 Interfaces

Interface statistics are available for the administrator to monitor network activities. Select ***Monitor->Interface*** to list all interfaces in the system.

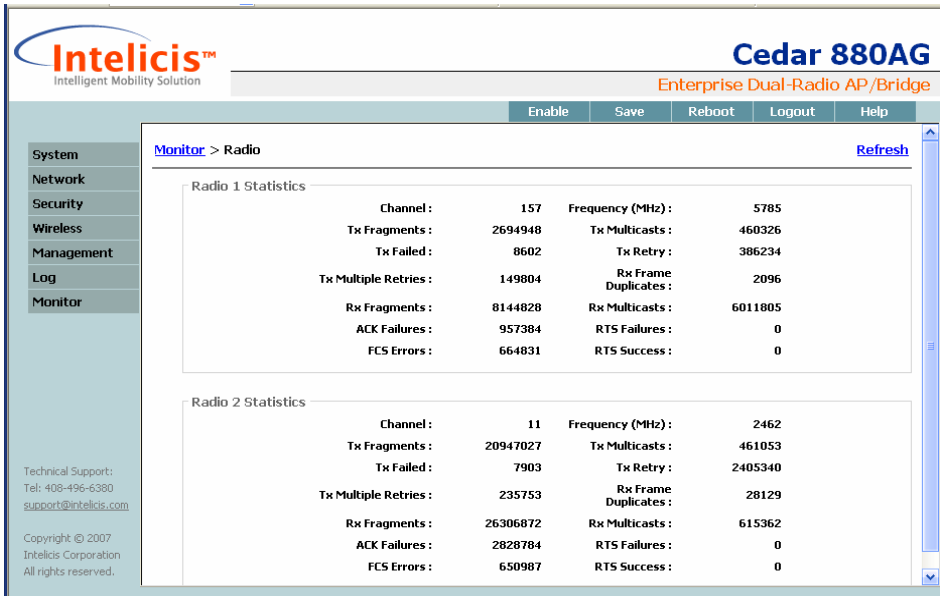


Click the individual interface name to display detailed statistics.



10.2 Wireless Statistics

Radio statistics are available for the administrator to monitor wireless network activities. Select ***Monitor->Radio*** to display radio 1 and radio 2 statistics.

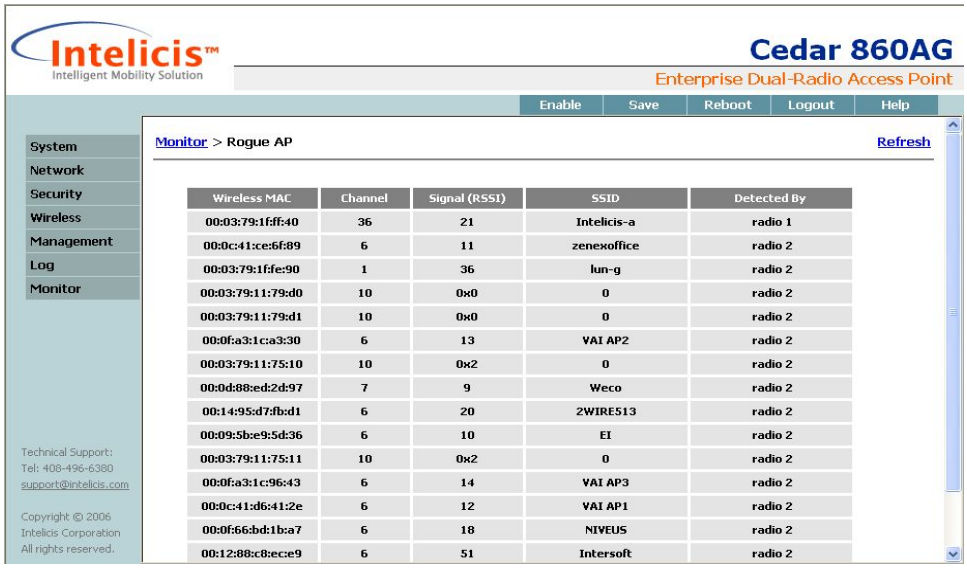


10.3 Rogue APs

Cedar periodically scans its coverage area for information about other access points. If any of the AP appears to be un-trusted or invalid, the administrator may consider to block its access by blocking the switch port that the AP is connected to.

Select ***Monitor->Rogue AP*** to display information about rogue APs.

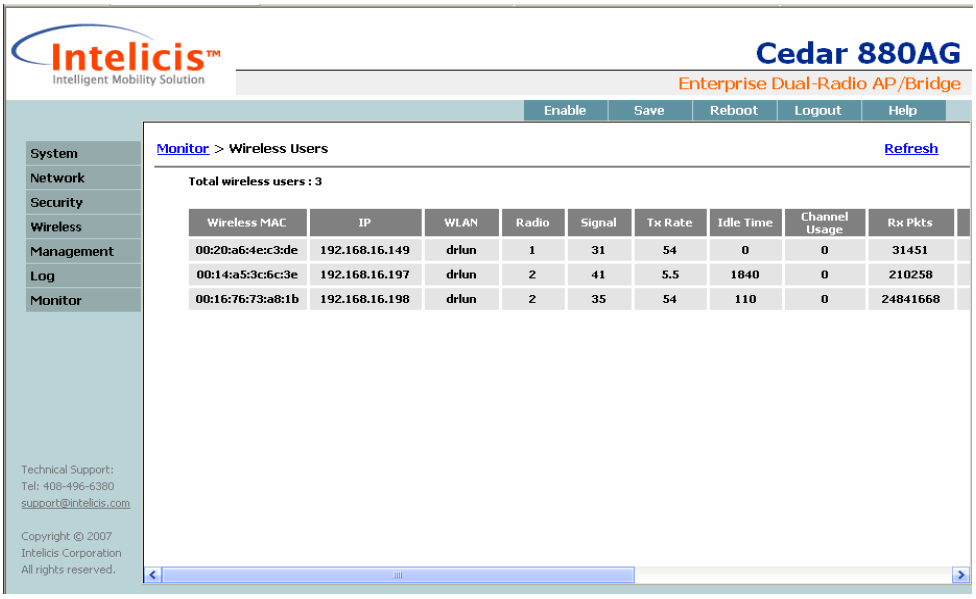
☞ The administrator needs to turn on the Rogue AP detection in the Radio screen in order to enable this feature.



Wireless MAC	Channel	Signal (RSSI)	SSID	Detected By
00:03:79:1f:ff:40	36	21	Intelicis-a	radio 1
00:0c:41:ce:6f:89	6	11	zenexoffice	radio 2
00:03:79:1f:fe:90	1	36	lun-g	radio 2
00:03:79:11:79:d0	10	0x0	0	radio 2
00:03:79:11:79:d1	10	0x0	0	radio 2
00:0f:a3:1c:a3:30	6	13	VAI AP2	radio 2
00:03:79:11:75:10	10	0x2	0	radio 2
00:0d:88:ed:2d:97	7	9	Weco	radio 2
00:14:95:d7:fb:d1	6	20	2WIRE513	radio 2
00:09:5b:e9:5d:36	6	10	EI	radio 2
00:03:79:11:75:11	10	0x2	0	radio 2
00:0f:a3:1c:96:43	6	14	VAI AP3	radio 2
00:0c:41:d6:41:2e	6	12	VAI AP1	radio 2
00:0f:66:bd:1b:a7	6	18	NIVEUS	radio 2
00:12:88:c8:ec:e9	6	51	Intersoft	radio 2

10.4 Wireless Users

The administrator can select ***Monitor->Wireless Users*** to monitor all the active wireless users.

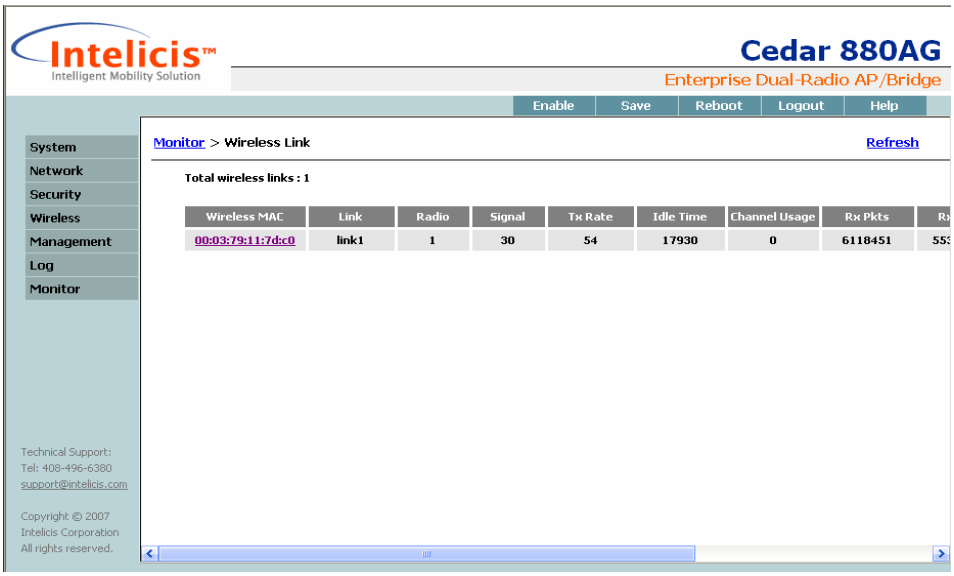


Description of the parameters:

Wireless MAC: MAC address of the wireless user.
IP: IP address of the wireless user.
WLAN: the WLAN which the wireless user associates to.
Radio: The radio (1 or 2) being used by the wireless user.
Signal: Signal to Noise Ratio at the AP when frames are received from the wireless user.
Tx Rate: Transmission rate.
Idle Time: The amount of the time the AP has remained inactive.
Channel Usage: A ratio indicating how busy the AP is.
Rx Pkts: Number of packets received.
Rx Bytes: Number of bytes received.
Tx Pkts: Number of packets transmitted.
Tx Bytes: Number of bytes transmitted.

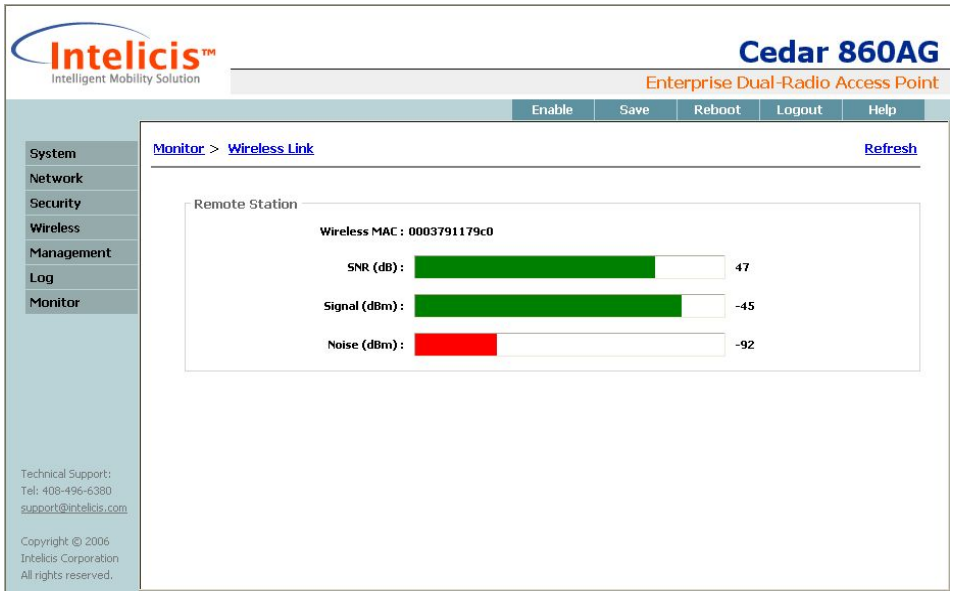
10.5 Wireless Link

The administrator can select ***Monitor->Wireless Link*** to monitor all the remote bridge links. Detailed signal strength can be viewed by clicking the individual bridge link.



Description of the parameters:

Wireless MAC: MAC address of the remote bridge link.
Link: link name.
Radio: The radio (1 or 2) being used by the bridge link.
Signal: Signal to Noise Ratio at the AP when frames are received from the bridge link.
Tx Rate: Transfer rate.
Idle Time: The amount of the time the AP has remained inactive.
Channel Usage: A ratio indicating how busy the AP is.
Rx Pkts: Number of packets received.
Rx Bytes: Number of bytes received.
Tx Pkts: Number of packets transmitted.
Tx Bytes: Number of bytes transmitted.



Description of the parameters:

SNR: Signal-to-Noise Ratio at the AP when frames are received from the bridge link. SNR is calculated according to the following formula; the higher this number, the better the signal quality. It is highly recommended to maintain the SNR in green color (larger than 36).

SNR (dB) = Signal (dBm) – Noise (dBm)

Signal: Signal strength.
Noise: Noise level.

☞ It is recommended to check SNR from both ends of the link to ensure the signal quality of the link is good.

10.6 Wireless Mesh

The administrator can select ***Monitor->Wireless Mesh*** to monitor links established for the mesh network.

Description of the parameters:

Status: Mesh status.
Radio: The radio where Mesh is operated on.
Role: AP is operated as a root or non-root node.
Min Link SNR: Minimal SNR

Level: How many levels between the local AP and the root AP. For the root AP, the level is always 0.
Link State: link status.
Local MAC: MAC address of the local AP.
Remote Uplink MAC: MAC address of the remote uplink AP.
Number of Downlinks: Number of down links.

Description of the link parameters:

Wireless MAC: MAC address of the remote bridge link.
Link: link name.
Radio: The radio (1 or 2) being used by the bridge link.
Signal: Signal to Noise Ratio at the AP when frames are received from the bridge link.
Tx Rate: Transfer rate.
Idle Time: The amount of the time the AP has remained inactive.
Channel Usage: A ratio indicating how busy the AP is.
Rx Pkts: Number of packets received.
Rx Bytes: Number of bytes received.
Tx Pkts: Number of packets transmitted.
Tx Bytes: Number of bytes transmitted.

11 Command Line Interface

The Command Line Interface is available through a serial console port, telnet or SSH. To establish a telnet or SSH connection, enter one of the following commands.

```
telnet 192.168.1.188
ssh 192.168.1.188
```

11.1 Base Commands

11.1.1 enable

Syntax:

enable

Description

This command allows the user to enter the privileged mode to do advanced configuration.

Example:

```
Cedar# enable
```

11.1.2 disable

Syntax:

disable

Description:

This command allows the user to leave the privileged mode and return back to basic mode.

Example:

```
Cedar# disable
```

11.1.3 config save

Syntax:

config save

Description:

Save the whole system configuration into non-volatile memory.

Example:

```
Cedar# config save
```

11.1.4 quit

Syntax:

quit

Description:

This command allows the user to quit from current CLI session. This command is equivalent to “exit”.

Example:

```
Cedar# quit
```

11.1.5 exit

S*yntax*:

exit

Description:

This command allows the user to quit from current CLI session. This command is equivalent to “quit”.

Example:

```
Cedar# exit
```

11.1.6 reboot

S*yntax*:

reboot

Description:

Reboot the system.

Example:

```
Cedar# reboot
```

11.1.7 reset

Syntax:

reset

Description:

Reset the current system configuration to manufacturer default and reboot the system.

Example:

```
Cedar# reset
```

11.1.8 up arrow

Syntax:

↑

Description:

Display the previous typed command from the command history table.

Example:

```
Cedar# ↑
```

11.1.9 down arrow

Syntax:

↓

Description:

Display the next typed command from the command history table.

Example:

```
Cedar# ↓
```

11.1.10 debug

Syntax:

debug { <module name> |
<module name> <level 1-5>
}

Description:

This command is used for enabling debug messages. The global debug switch must be on in order to see the debug messages. The different debug level can be used to control the amount of debug messages in the specified module.

Example:

```
Cedar# debug //enable global switch for debug messages
Cedar# debug auth 3
```

11.1.11 undebug

Syntax:

undebug { <module name> }

Description:

This command is used for disabling debug message. The global debug switch or specific module debug switch can be turned off by using this command.

Example:

```
Cedar# undebug
Cedar# undebug auth
```

11.1.12 help

Syntax:

help or ?

Description:

Display the current available command options.

Example:

```
Cedar# help
Cedar# ?
```

11.2 System Commands

11.2.1 show system

Syntax

show system

Description:

Display system information; including system login name, model, firmware version, system time and system up time.

Example:

```
Cedar# show system
```

11.2.2 config system

Syntax:

config system {
name <string> |
login_name <string> |
password <string> |
enable_password <string> |
session_timeout <# in minute> |
export runtime_cfg <host/file name[/username/password]> |
import runtime_cfg <host/file name[/username/password]>
}

Description:

Configure system related parameters.

name:	System name
login_name:	The username for system login.
password:	The password for system login.
enable_password:	The password to enter privilege mode to do advance configurations or operations
sesssion_timeout:	The idle timeout for the CLI session.
time:	System time
export:	The AP configuration can be exported to a file on an FTP server.
import:	The CLI command file can be imported from an FTP server.

Example:

```
Cedar# config system name MyAP
Cedar# config system session_timeout 30
```

```
Cedar# config system import runtime_cfg 192.168.1.1/cli_batch
```

11.2.3 show sntp

Syntax

show sntp

Description:

Display SNTP related information, such as SNTP server location and offset.

Example:

```
Cedar# show sntp
```

11.2.4 config sntp

Syntax:

config sntp {
<on | off> |
server <ip address | server name> |
offset <# in hour>
}

Description:

Configure SNTP related parameters.

server:	SNTP server location.
offset:	Offset to the UTC time.

Example:

```
Cedar# config sntp on
Cedar# config sntp offset -8
```

11.2.5 upgrade

Syntax:

upgrade {
<ftp | tftp>
server <host> |
file <file name> |
username <username> |
password <password>
}

Description:

Upgrade system firmware. The system uses the provided username and password to retrieve new firmware from either FTP or TFTP server and then performs the upgrade. If the username and password are not provided, ‘anonymous’ with no password are used to retrieve firmware.

Example:

```
Cedar# upgrade ftp server 10.10.10.123 file firmware09012004.bin
```

11.3 Network Commands

11.3.1 show interface

Syntax:

show interface { all | <if name>}

Description:

Display interface information.

all: Display the information of all interfaces.

Example:

```
Cedar# show interface lan
Cedar# show interface all
```

11.3.2 config interface

Syntax:

config interface <if name> {
<on | off> |
ip <0 | 1 | 2 | 3 | 4> {
[addr <ip address>]
[netmask <netmask address>]
[mode <static | dhcp >]
[clear]
}
}

Description:

Configure interface IP addresses and operation mode. Each interface allows up to 5 different IP addresses.

clear: It is used to reset the IP and netmask to 0.0.0.0.

Example:

```
Cedar# config interface lan ip 0 addr 192.168.100.1 netmask
255.255.255.0
Cedar# config interface lan ip 0 mode static
```

11.3.3 show vlan

Syntax:

show vlan { all | <vlan name>}

Description:

Display vlan device information.

Example:

```
Cedar# show vlan all
Cedar# show vlan lan
```

11.3.4 config vlan

Syntax:

config vlan {
mgmt_vid <vlan id #> |
<vlan name> {
aging <# in seconds>] |
stp <on | off>
}
}

Description:

VLAN interface is created automatically by the system when management vid (mgmt_vid) or WLAN vid is configured to value other than “untagged”.

aging:	The time interval an inactive MAC address remains in the MAC table before it is removed.
stp:	Enable/Disable 802.1d Spanning Tree Protocol (STP).

Example:

```
Cedar# config vlan vlan80 stp on
Cedar# config vlan vlan80 aging 500
```

11.3.5 show ip

Syntax:

show ip {
dhcp |
dhcp table |
dhcp pool <pool id> |
dns |
route
}

Description:

dhcp:	Display DHCP summary.
dhcp table:	Display client IP addresses assignment.
dhcp pool:	Display specific DHCP pool.
dns:	Display primary and secondary DNS.
route:	Display routing table.

Example:

```
Cedar# show ip dhcp
Cedar# show ip dhcp table
```

```
Cedar# show ip dhcp pool 0
```

```
Cedar# show ip dns
```

```
Cedar# show ip route
```

11.3.6 config ip

Syntax:

config ip {dhcp … | dns … | route …}

Description:

dhcp:	Configure DHCP server related operations.
dns:	Configure DNS related operations.
route:	Configure routing table related operations.

Example:

See ‘config ip dhcp’, ‘config ip dns’ and ‘config ip route’ sections for details.

config ip dhcp

Syntax:

Config ip dhcp {
<on | off> |
pool <pool id> {
<on | off> |
[net <net address>]
[netmask <netmask address>]
[range_start <ip address>]
[range_end <ip address>]

[dns <ip address>]
[wins <ip address>]
[gw <ip address>]
[lease_time <time in seconds>]
}
}

Description:

net:	The network address of the specified DHCP pool.
netmask:	The network mask address of the specified DHCP
range_start :	Starting IP address used for pool range control
range_end:	Ending IP address used for pool range control
dns:	Domain Name Server IP address
wins:	Windows Internet Name Server IP address
gw:	Gateway IP address.
lease_time:	Valid time period for assigned IP from DHCP server

Example:

```
Cedar# config ip dhcp on
Cedar# config ip dhcp pool 0 off
```

```
Cedar# config ip dhcp pool 0 net 10.60.0.0 netmask 255.255.0.0 gw
10.60.1.1
```

```
Cedar# config ip dhcp pool on
```

config ip dns

Syntax:

config ip dns {
primary < ip address> |
secondary <ip address>
}

Description:

Configure the IP address of the primary and secondary DNS servers.

Example:

```
Cedar# config ip dns primary 206.13.28.12
Cedar# config ip dns secondary 206.13.29.12
```

config ip route

Syntax:

config ip route {add | del} {
net <net address>
netmask <netmask address>
[gw <ip address>]
if < if name>
}

Description:

add:	Add a route entry in the routing table.
del:	Delete a route entry in the routing table.
net:	The network address of the specified route will apply.
netmask:	The network mask address of the specified route will apply.
gw:	The gateway IP address of the specified route will apply.
if:	The interface of the specified route will apply.

Example:

```
Cedar# config ip route add net 10.60.0.0 netmask 255.255.0.0 if lan
Cedar# config ip route add net 0.0.0.0 netmask 0.0.0.0 gw
67.100.23.68 if lan
```

```
Cedar# config ip route del net 10.60.0.0 netmask 255.255.0.0
```

11.4 Security Commands

11.4.1 show auth

Syntax:

show auth profile { all | <profile name> }

Description:

all:	Display all authentication profiles.
<profile name>:	Display detailed authentication profile.

Example:

```
Cedar# show auth profile all
Cedar# show auth profile EAP
```

11.4.2 config auth

Syntax:

config auth { 8021x … |
mac … |
radius …
}

Description:

Configure 802.1x, mac or radius authentication profile.
See 'config auth …' sections for details.

config auth radius

Syntax:

config auth radius profile {
add <profile name> |
del <profile name> |
<profile name> {
[radius_failover_limit <#>]
[radius_nas_ip <ip address>]
[primary_radius_retry_period <#>]
[primary_auth_ip <ip address>]
[primary_auth_port <#>]
[primary_auth_secret <string>]
[secondary_auth_ip <ip address>]
[secondary_auth_port <#>]
[secondary_auth_secret <string>]
[primary_accounting_ip <ip address>]
[primary_accounting_port <#>]
[primary_accounting_secret <string>]
[secondary_accounting_ip <ip address>]
[secondary_accounting_port <#>]
[secondary_accounting_secret <string>]
}
}

Description:

radius_failover_limit:	Number of retries for the primary radius server before switching to the secondary radius server. Default is 4.
primary_radius_retry_period:	Retry period in seconds for the primary radius server. Default is 600.
radius_nas_ip:	IP address of the AP.
primary_auth_ip:	IP address of the primary authentication radius server.
primary_auth_port	The listen port number of the primary radius server. Default value is 1812
primary_auth_secret	The secret for communicating with the primary authentication radius server. Default value is 'changeitnow'
secondary_auth_ip:	IP address of the secondary authentication radius server.
secondary_auth_port:	The listen port number of secondary authentication radius server. Default value is 1812.
secondary_auth_secret:	The secret for communicating with the secondary authentication radius server. Default value is 'changeitnow'.
primary_accounting_ip:	IP address of the primary accounting radius server.
primary_accounting_port	The listen port number of primary accounting radius server. Default value is 1812
primary_accounting_secret	The secret for communicating with the primary accounting radius server. Default value is 'changeitnow'
secondary_accounting_ip:	IP address of the secondary accounting radius server.
secondary_accounting_port:	The listen port number of secondary accounting radius server. Default value is 1812.
secondary_accounting_secret:	The secret for communicating with the primary accounting radius server. Default value is 'changeitnow'.

Example:

```
Cedar# config auth radius profile add Cypress
Cedar# config auth radius profile Cypress primary_auth_ip
192.168.1.1
```

```
Cedar# config auth radius profile Cypress primary_auth_secret
mysecret
```

config auth 8021x

Syntax:

config auth 8021x profile {

add <profile name> |
del <profile name> |
<profile name> {
[reauthentication <on | off>]
[reauthentication_period <# in seconds>]
[wep_key_len < 64 | 128 >]
[wep_key_interval < 0 | 60-2592000>]
}
}

Description:

reauthentication:	Enable/Disable re-authentication.
reauthentication_period:	Re-authentication timer in seconds. Default is 3600 seconds.
wep_key_len:	The length of the generated dynamic WEP keys in bits. Default is 128 bits.
Wep_key_interval:	The time interval the dynamic WEP keys will be re-generated. Default is 300 seconds.

Example:

```
Cedar# config auth 8021x profile add EAP
Cedar# config auth 8021x profile EAP wep_key_len 64
```

config auth mac

Syntax:

config auth mac profile {
add <profile name> |
del <profile name> |
<profile name> {
[permitadd <MAC address>]
[permitdel <MAC address>]
[denyadd < MAC address>]
[denydel < MAC address>]
[auth_method <permit | deny | radius>]
}
}

Description:

permitadd:	Add an MAC address to the Permit List.
permitdel:	Delete an MAC address from the Permit List.
denyadd:	Add an MAC address to the Deny List.
denydel:	Delete an MAC address from the Deny List.
auth_method:	Choose from permit, deny or radius.

Example:

```
Cedar# config auth mac profile add MAC
Cedar# config auth mac profile MAC denyadd 000cf157b3be
```

```
Cedar# config auth mac profile MAC auth_method radius
```

11.4.3 show filter

Syntax:

show filter

Description:

Display all the filters.

Example:

```
Cedar# show filter
```

11.4.4 config filter

Syntax:

config filter {
<on | off> |
add {
{ mac | ip }<address> |
[action <deny | permit | next>]
[protocol <tcp | udp | icmp>]
[src_port <port #>]
[dst_port <port #>]
[priority <1-n>]
[if <interface name>] } |
del <filter id> |
entry <filter id > {
<on | off> |
[mac <MAC address>]

[ip <ip address>]
[protocol <tcp | udp | icmp>]
[src_port <port #>]
[dst_port <port #>]
[priority <1-n>]
[if <interface name>]
[action <deny | permit | next>]
}
}

Description:

action:	'deny': packets that match the rules will be dropped. 'permit': packets that match the rules will be accepted. 'next': packets that match the rules will go to the immediate next rule to do further matching. It is used for multiple rule chain.
priority:	'1' is the highest priority.
mac:	'000000000000' means all MAC addresses.
ip:	'0.0.0.0' means all IP addresses.

Example:

```
Cedar# config filter add mac 001122334455 action deny
Cedar# config filter entry 8 on

Cedar# config filter entry 8 order 1

Cedar# config filter del 8

Cedar# config filter on
```

11.5 Wireless Commands

11.5.1 show wireless

Syntax:

show wireless { summary | rogue | users | link | link <MAC address>}

Description:

summary:	Display wireless summary information.
rogue:	Display all the rogue APs detected by Cedar.
users:	Display all the active wireless users which are using the AP.
link:	Display all the wireless bridge links.
link <MAC>:	Display individual wireless bridge link.

Example:

```
Cedar# show wireless summary
Cedar# show wireless rogue
```

```
Cedar# show wireless link
```

11.5.2 config wireless

Syntax:

config wireless {
<on | off> |
80211d < on | off > |
eap_relay < on | off >
}

Description:

8021ld:	Enable/Disable 802.1 world mode.
eap_relay:	Enable/Disable EAP related authentication in AP.

Example:

```
Cedar# config wireless on
Cedar# config wireless eap_relay off
```

11.5.3 show wlan

Syntax:

show wlan { all | <wlan name>}

Description:

all:	Display a summary of all the WLANs.
<wlan name>:	Display detailed WLAN configuration.

Example:

```
Cedar# show wlan all
Cedar# show wlan Intelicis-a
```

11.5.4 config wlan

Syntax:

config wlan {
add <wlan name> |
del <wlan name> |
<wlan name> {
[ssid <string>]
[ssid_broadcast < on | off >]
[vid < untagged | vlan id >]
[tx_rate < auto | # >]
[max_tx_rate < auto | #>
[min_associate_rate < auto | #>]
[dtim <1-255>]
[max_stations < 0-2077>]
[associate < open | wpa | wpa2 | wpa-psk | wpa2-psk |
wpa,wpa2 | wpa-psk,wpa2-psk >]
[encrypt < none | wep | tkip | aes | wep,tkip | wep,aes |
tkip,aes | wep,tkip,aes >]
[wep_key_0 <string that is 5, 13 or 16 characters long>]
[wep_key_1 <string that is 5, 13 or 16 characters long>]
[wep_key_2 <string that is 5, 13 or 16 characters long>]
[wep_key_3 <string that is 5, 13 or 16 characters long>]
[default_wep_key < 0 | 1 | 2 | 3>]
[wpa_psk < string that is 8 to 63 characters long>]
[8021x_auth < on | off >]
[8021x_auth_profile < clear | “profile name” >]
[mac_auth < on | off >]
[mac_auth_profile < clear | “profile name”>]
[radius_profile < clear | “profile name”>]
}
}

Description:

ssid:	A unique identifier used by mobile users to connect to a wireless network.
ssid broadcast:	Enable/Disable SSID to be broadcast to all wireless devices.
vid:	Enable/Disable VLAN tag to be used.
tx_rate:	A transmission rate that will be used for all unicast frames.
max_tx_rate:	Maximum limit on the transmission rate.
min_associate_rate:	Minimum transmission rate required for association.
dtim:	The Deferred Traffic Indicator Map used with clients that have power management enabled.
max_stations:	Maximum number of stations that can associate with the AP.
max_tx_rate:	Maximum limit on the transmission rate.
associate:	The association type between the client and AP connection.
encrypt:	The encryption mechanism used for the association.
wep_key_#:	The WEP key used for encryption.
default_wep_key:	The index to the WEP key.
wpa_psk:	WPA PSK passphrase.
8021x_auth:	Enable/Disable 802.1x authentication.
8021x_auth_profile:	The 802.1x auth profile to be used for authentication.
mac_auth:	Enable/Disable MAC authentication.
mac_auth_profile:	The MAC auth profile to be used for authentication.
radius_profile:	The RADIUS auth profile to be used for authentication.

Example:

```
Cedar# config wlan add wepkey
Cedar# config wlan wepkey associate open encrypt wep
Cedar# config wlan wepkey default_wep_key 0 wep_key_0 wepke
Cedar# config wlan wepkey mac_auth_profile MAC
Cedar# config wlan wepkey mac_auth on
```

11.5.5 show radio

Syntax:

show radio { 1 | 2}

Description:

Display radio 1 or radio 2 detailed information.

Example:

```
Cedar# show radio 1
```

11.5.6 config radio

Syntax:

config radio <1 | 2> {
[rf < on | off >]
[freq < a | super-ag > for radio 1,
<b|g|bg|super-ag> for radio 2]
[channel < see below >]
[auto_channel_list < see below >]
[basic_rates < see below >]
[supported_rates < see below>]
[tx_power < auto | 0-20 dbm>]
[mode < ap | brglnk | ap,brglnk>]
[role < base | non-base>]
[repeater < on | off>]
[beacon <20-1000 ms>]
[preamble < long | short>]
[fragm_threshold < 256-2346 >]
[rts_threshold < 0-2347 >]
[cts_protection <on | off>]
[antenna < diversity | 1| 2 >]
[drop_load < off | 0-99 >]
[deny_load < off | 0-99 >]
[intra_bss < on | off>]
[rogue_detection < on | off>]
[wmm < on | off >]
[distance < 0-50 kilometers >]
[wlanadd < wlan name >]
[wlandel < wlan name>]
[brglnkadd < brglnk name>]
[brglnkdel < brglnk name>]
}

Description:

rf:	Enable/Disable radio frequency.
freq:	Communication mode between wireless clients and the AP.
channel:	Channel used between wireless clients and the AP. auto: AP automatically chooses a relatively unused channel. freq b,g, bg: 1-14 freq a: 36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161, 165 freq super-ag, radio 1: 40, 48, 56, 153, 161

freq super-ag, radio 2: 6

auto_channel_list:
A list of channel numbers for auto-channeling.
default: all the available channels
freq b,g, bg: 1-14
freq a: 36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161, 165

basic_rates & supported_rates: Transmission rate used between wireless clients and the AP.
freq a: 6, 9, 12, 18, 24, 36, 48, 54
freq b: 1, 2, 5.5, 11
freq g: 6, 9, 12, 18, 24, 36, 48, 54
freq bg: 1, 2, 5.5, 11, 6, 9, 12, 18, 24, 36, 48, 54

tx_power: transmit power used between wireless clients and the AP.

mode: AP only, bridge only or both.

role: role of the bridge.

repeater: Enable/disable repeater mode.

beacon: Beacon transmit frequency.

preamble: Allow wireless clients to synchronize with the AP.

fragm_threshold: Fragmentation threshold.

rts_threshold: Request-to-send threshold.

cts_protection: Enable/Disable Clear-to-send protection.

antenna: Antenna to receive and transmit signals.

drop_load: If the air time load is greater than the given parameter, disassociate a station.

deny_load: If the air time load is greater than the given parameter, new stations are not allowed.

intra_bss: Enable/Disable communication between wireless clients within an AP.

rogue_detection: Enable/Disable rogue AP detections.

mmm:

distance:

wlanadd: Add a WLAN to this radio.

wlandel: Remove a WLAN from this radio.

brglnkadd: Add a bridge link to this radio.

brglnkdel: Remove a bridge link from this radio.

Example:

```
Cedar# config radio 2 channel 10
Cedar# config radio 2 wlanadd newWLAN
```

```
Cedar# config radio 1 brglnkadd newLink
```

11.5.7 show brglnk

Syntax:

show brglnk { all | <brglnk name>}

Description:

all:	Display a summary of all the bridge links.
<brglnk name>:	Display detailed bridge link configuration.

Example:

```
Cedar# show brglnk all
Cedar# show brglnk myLink
```

11.5.8 config brglnk

Syntax:

config brglnk {
add <brglnk name> |
del <brglnk name> |
<brglnk name> {
[link_ssid < string >]
[security_key <string that is 8 to 63 characters lon>]
}
}

Description:

link_ssid:	SSID used between the base and non-base bridges.
security_key:	The security key used between the base and non-base bridges

Example:

```
Cedar# config brglnk add newLink
Cedar# config brglnk newLink link_ssid 123 security_key 12345678
```

11.6 Management Commands

11.6.1 show telnet

Syntax:

show telnet

Description:

Display TELNET server configuration.

Example:

```
Cedar# show telnet
```

11.6.2 config telnet

Syntax:

config telnet {<on | off> | [port <port #>] }

Description:

Configure TELNET server parameters.

port: Port number which TELNET server will listen to

Example:

```
Cedar# config telnet port 12000
Cedar# config telnet on
```

11.6.3 show ssh

Syntax:

show ssh

Description:

Display SSH server configuration.

Example:

```
Cedar# show ssh
```

11.6.4 config ssh

Syntax:

config ssh {<on | off> | port <port #> }

Description:

Configure SSH server parameters.

Example:

```
Cedar# config ssh port 12000
Cedar# config ssh on
```

11.6.5 show web

Syntax:

show web

Description:

Display WEB server configuration.

Example:

```
Cedar# show web
```

11.6.6 config web

Syntax:

config web {<on | off> | port <port #>}

Description:

Configure WEB server settings.

Example:

```
Cedar# config web on
Cedar# config web port 80
```

11.6.7 show snmp

Syntax:

show snmp

Description:

Display SNMP configuration.

Example:

```
Cedar# show snmp
```

11.6.8 config snmp

Syntax:

config snmp {
<on | off> |
community <community name> {
[name <string>]
[write < on | off>]
}
}

Description:

Configure SNMP community settings.

name:	SNMP community name.
write:	Enable or disable write privilege.

Example:

```
Cedar# config snmp on
Cedar# config snmp community private write on
```

```
Cedar# config snmp community public name aaa
```

```
Cedar# config snmp community aaa write off
```

11.6.9 show syslog

Syntax:

show syslog

Description:

Display system logging events.

Example:

```
Cedar# show syslog
```

11.6.10 config syslog

Syntax:

config syslog {<on | off> | clear}

Description:

Configure system log settings.

Example:

```
Cedar# config syslog on
Cedar# config syslog clear
```

11.7 Miscellaneous Commands

11.7.1 ping

Syntax:

ping <host>

Description:

A utility to test the network connection between two hosts.

Example:

```
Cedar# ping 100.100.100.1
```

11.7.2 traceroute

Syntax:

traceroute <host>

Description:

A network utility to retrieve network routing path information.

Example:

```
Cedar# traceroute www.yahoo.com
```

11.7.3 show arp

Syntax:

show arp

Description:

Display ARP table information.

Example:

```
Cedar# show arp
```

11.7.4 show memory

Syntax:

show memory

Description:

Display system memory usage information.

Example:

```
Cedar# show memory
```

11.8 Examples

11.8.1 System Commands

Here are some examples of how to execute system commands using the Command Line Interface.

1. To change the system's name:

```
Cedar# config  system name MyCedar
```

2. To change the login password:

```
Cedar# config system password
 Current Password:
 New Password:
 Re-confirmed:
```

3. To change the privilege password:

```
Cedar# config system enable_password
 Current Password:
 New Password:
 Re-confirmed:
```

4. To change the SNTP offset to Pacific Standard Time zone.

```
Cedar# config sntp offset –8
```

5. To upgrade the firmware:

```
Cedar# upgrade ftp server 192.168.15.184 username admin password xxxx file
cedar880ag-05172005-1.0.0.120a.bin
```

6. To execute a CLI command file:

```
Cedar# import system runtime_cfg 192.168.15.184/batch.cli/admin/xxx
```

11.8.2 Network Commands

Network parameter changes take effect immediately. You can perform the following CLI commands via the console.

1. Configure static IP address, for example 192.168.1.188.

```
Cedar# config interface lan ip 0 mode static
Cedar# config interface lan ip 0 addr 192.168.1.188 netmask 255.255.255.0
Cedar# show interface lan
```

2. Configure default route. For example, direct all unknown traffic to 192.168.1.1. A default route has both the net and netmask parameters set to 0.0.0.0.

```
Cedar# config ip route add net 0.0.0.0 netmask 0.0.0.0 gw 192.168.1.1 if lan
Cedar# show ip route
```

3. Configure domain name servers. For example, change the primary DNS to 192.168.1.1

```
Cedar# config primary dns 192.168.1.1
Cedar# show ip dns
```

4. Save the configuration changes.

```
Cedar# config save
```

5. Configure management VLAN ID, for example 4094.

```
Cedar# config vlan mgmt_vid 4094
Cedar# show vlan all
```

11.8.3 802.1x Authentication

1. Create some 802.1x user entries in a Cypress RADIUS server.

```
Cedar# config radius user_db add test1/test1/eap
Cedar# config radius user_db add test2/test2/eap
```

2. Create a RADIUS profile.

```
Cedar# config auth radius profile add myRADIUS
Cedar# config auth radius profile myRADIUS primary_auth_ip 192.168.1.1
Cedar# config auth radius profile myRADIUS primary_auth_secret xxx
Cedar# show auth profile myRADIUS
```

3. Configure an 802.1x authentication profile.

```
Cedar# config auth 8021x profile add my8021x
Cedar# config auth profile my8021x
```

4. Save the configuration changes.

```
Cedar# config save
```

11.8.4 MAC Authentication

1. Create a MAC user entry in a Cypress RADIUS server.

```
Cedar# config radius user_db add 000cf157b3bc//mac
```

2. Create a RADIUS profile.

```
Cedar# config auth radius profile add myRADIUS
Cedar# config auth radius profile myRADIUS primary_auth_ip 192.168.1.1
Cedar# config auth radius profile myRADIUS primary_auth_secret xxx
Cedar# show auth profile myRADIUS
```

3. Configure a MAC authentication profile.

```
Cedar# config auth mac profile add myMAC
Cedar# config auth mac profile myMAC auth_method radius
Cedar# show auth profile myMAC
```

4. Save the configuration changes.

```
Cedar# config save
```

11.8.5 WLAN with WPA and 802.1x Authentication

1. Create a WLAN.

```
Cedar# config wlan add myWLAN
Cedar# config wlan myWLAN ssid myWLAN
Cedar# config wlan myWLAN associate wpa encrypt tkip
Cedar# config wlan myWLAN radius_profile myRADIUS
Cedar# config wlan myWLAN 8021x_auth_profile my8021x
Cedar# config wlan myWLAN 8021x_auth on
Cedar# show wlan myWLAN
```

2. Add this WLAN to Radio 2.

```
Cedar# config radio 2 wlanadd myWLAN
Cedar# show radio 2
```

3. Save the configuration changes.

```
Cedar# config save
```

11.8.6 WLAN with WEP and MAC Authentication

1. Create a WLAN.

```
Cedar# config wlan add myWLAN
Cedar# config wlan myWLAN ssid myWLAN
Cedar# config wlan myWLAN associate open encrypt wep
Cedar# config wlan myWLAN default_wep_key 0 wep_key_0 wepke
Cedar# config wlan myWLAN radius_profile myRADIUS
Cedar# config wlan myWLAN mac_auth_profile myMAC
Cedar# config wlan myWLAN mac_auth on
Cedar# show wlan myWLAN
```

2. Add this WLAN to Radio 2.

```
Cedar# config radio 2 wlanadd myWLAN
Cedar# show radio 2
```

3. Save the configuration changes.

```
Cedar# config save
```

11.8.7 Bridge Link

1. Create a Bridge Link.

```
Cedar# config brglnk add myLink
Cedar# config brglnk myLink link_ssid 123
Cedar# config brglnk myLink security_key 12345678
Cedar# show brglnk myLink
```

2. Add this brglnk to Radio 1.

```
Cedar# config radio 1 channel 36
Cedar# config radio 1 mode brglnk
Cedar# config radio 1 role base
# Change primary wlan on radio 1 to wpa2/aes security
Cedar# config wlan Intelicis-a associate wpa2 encrypt aes
Cedar# config radio 1 brglnkadd myLink
Cedar# show radio 1
```

3. Save the configuration changes.

```
Cedar# config save
```

11.8.8 Bridge Link with Multiple VLANs

1. Configure management VLAN ID, for example 4094.

```
Cedar# config vlan mgmt_vid 4094
Cedar# show vlan all
```

1 Create a WLAN with VLAN ID.

```
Cedar# config wlan add myWLAN
Cedar# config wlan myWLAN ssid myWLAN vid 4094
Cedar# config wlan myWLAN associate wpa encrypt tkip
Cedar# config wlan myWLAN radius_profile myRADIUS
Cedar# config wlan myWLAN 8021x_auth_profile my8021x
Cedar# config wlan myWLAN 8021x_auth on
Cedar# show wlan myWLAN
```

2 Follow instructions in Chapter 11.8.7 to create bridge link and add it to Radio 1.

3 Add WLAN to Radio 1 and Radio 2 (Radio 1 is for brglnk, Radio 2 is for remote wireless clients)

```
Cedar# config radio 1 wlanadd myWLAN
Cedar# show radio 1
Cedar# config radio 2 wlanadd myWLAN
Cedar# show radio 2
```

4. Save the configuration changes.

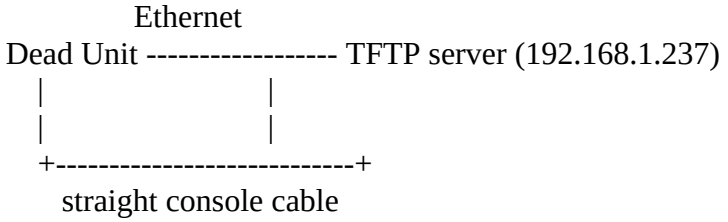
```
Cedar# config save
```

Appendix I - Recovery Procedure

If you are not able to receive the login prompt from Cedar via the console port, your AP may have been corrupted. Please follow the procedure described below to recover the AP.

1. Download the firmware burner (FwBurner) and firmware images (FwFlash.img) from the Intelicis website support.intelicis.com and save them in a TFTP server. Do not change the names of the images. Configure the IP of the TFTP server to 192.168.1.237.

2. Power off the dead unit and connect the LAN port of the dead unit with the TFTP server. Use a standard serial port cable to connect the console port with the TFTP server. The baud rate for the serial port is 115200.



3. Power on the dead unit and you will see "Start booting..." message in console. Press the Control C (^C) key immediately within 1 second. The boot loader will detect the Control C(^C) key and display the following prompt.

```
RedBoot>
```

4. Download the firmware burner image from TFTP server and run the burner by typing the following commands.

```
RedBoot> load FwBurner
```

If the download is successful, you will see the following message and prompt.

```
Entry point: 0x800100bc, address range: 0x80010000-0x80051b60
RedBoot>
```

Note that it is normal to see different loaded address because of the different image size.

5. Typing "go" will start the burning process of the flash image. After the process has completed successfully, the unit will reboot automatically.

```
RedBoot>go
Start booting...
Could not find valid MAC address for enet0.  Using default!
```

```
Ethernet eth0: MAC address 00:03:7f:e0:02:bf
IP: 192.168.1.1/255.255.255.0, Gateway: 192.168.1.237
Default server: 192.168.1.237, DNS server IP: 192.168.1.237

RedBoot(tm) bootstrap and debug environment [RAM]
Non-certified release, version v2_0 - built 18:22:58, May 13 2006

Copyright (C) 2000, 2001, 2002, Red Hat, Inc.
Copyright (C) 2005, Devicescape Software, Inc.

RAM: 0x80010000-0x81000000, 0x8006ad50-0x80fe1000 available
FLASH: 0xbe000000 - 0xbe7e0000, 126 blocks of 0x00010000 bytes each.
== Executing boot script in 4.000 seconds - enter ^C to abort
RedBoot> load -r -v -b 0x80100000 FwFlash.img

Raw file loaded 0x80100000-0x8087ffff, assumed entry at 0x80100000
RedBoot> burnflash
** Flash burning process would take a while. Please wait.
** Complete flash image burning successfully.
** System is rebooting...
```

6. Now you should be able to gain access to the unit again and upgrade its firmware by the normal procedure described in Chapter 4.